OIPE IAP13
MAR 22 2006
PATENT & TRADEMARK OFFICE

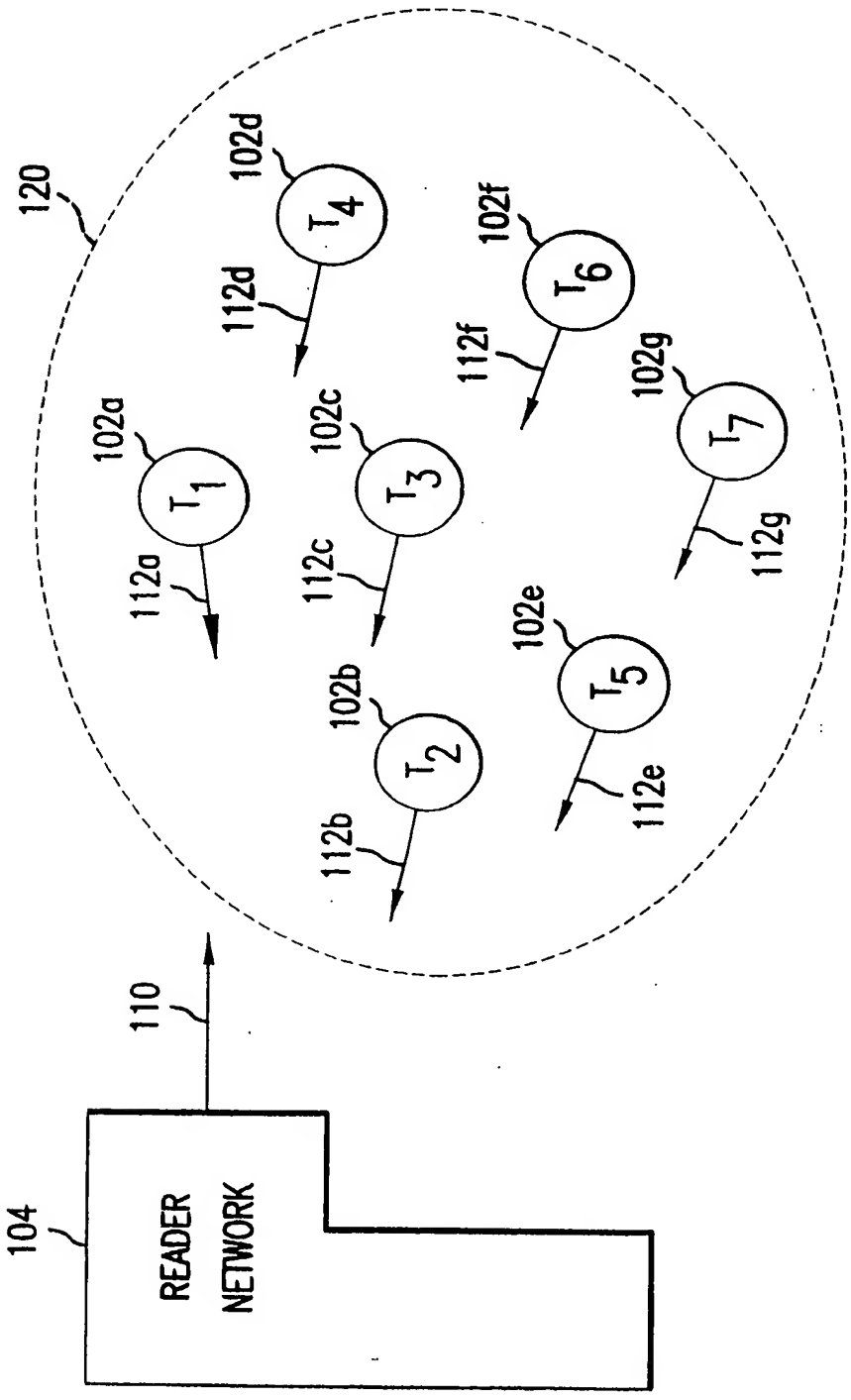

FIG. 1

OIPE
MAR 22 2006
IAP13
PATENT & TRADEMARK OFFICE

Replacement Sheet
Sheet 2 of 55
Appl. No. 10/072,885; Filed: Feb 12, 2002
Dkt No. 1689.0210001; Group Unit: 2636
Inventors: SHANKS et al.
Tel. No.: 202-371-2600
For: Method, System, and Apparatus for Binary Traversal of a Tag Population

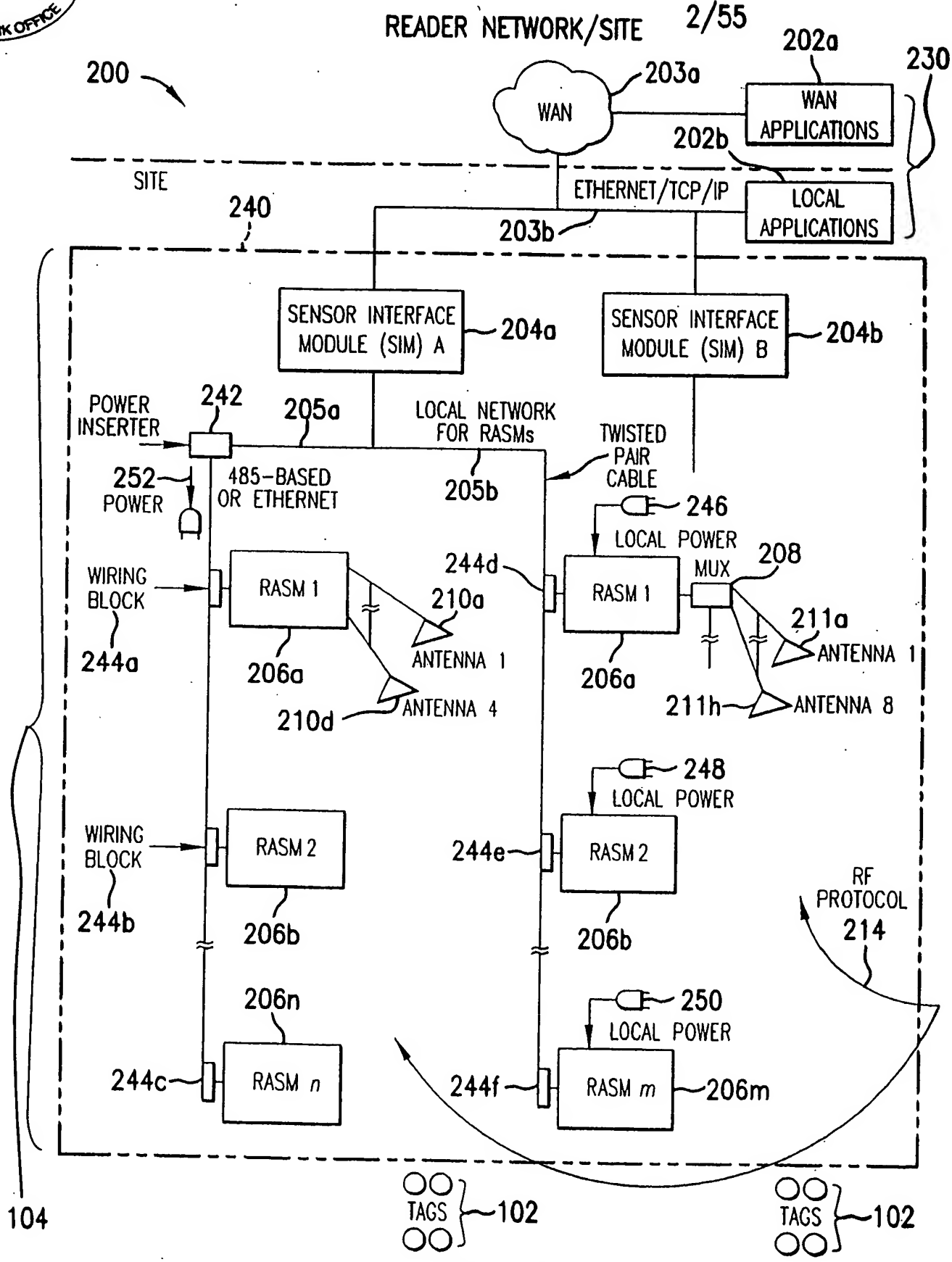

FIG. 2

OIPE IAP13
MAR 22 2006
PATENT & TRADEMARK OFFICE

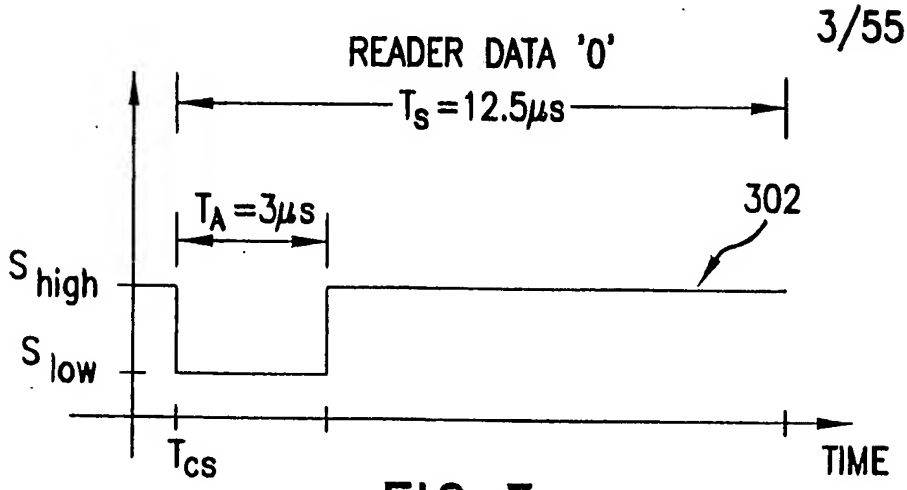

FIG. 3

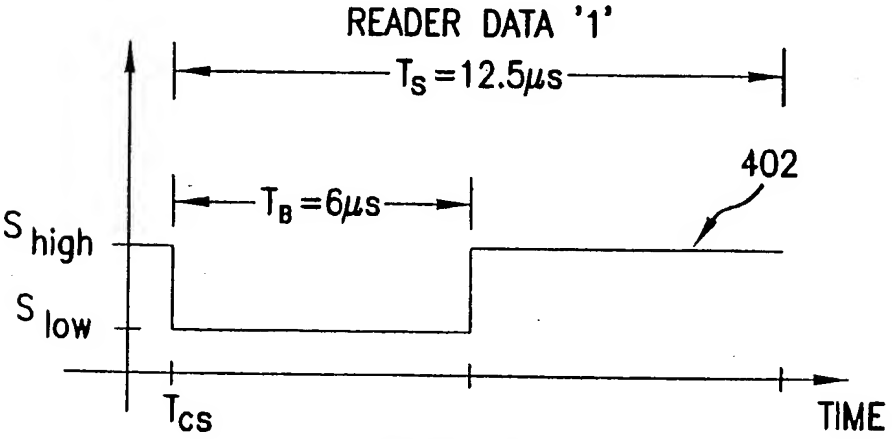

FIG. 4

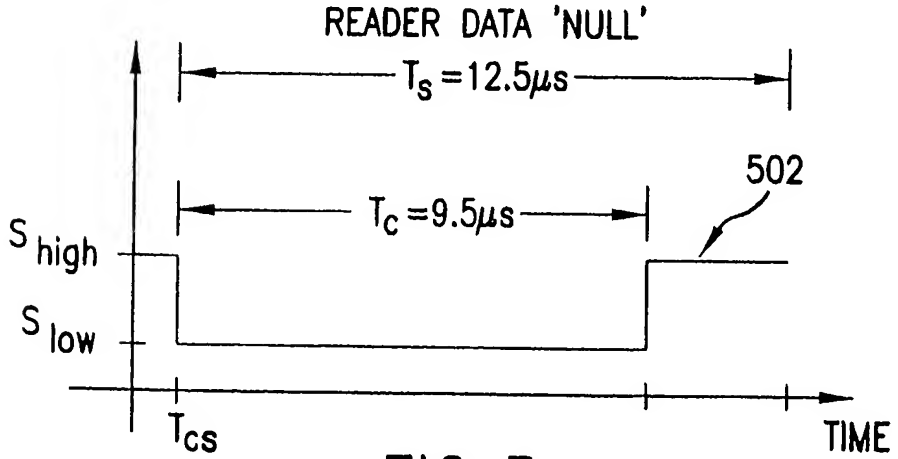

FIG. 5

OIPE IAP13
MAR 22 2006
PATENT & TRADEMARK OFFICE

READER BIT '0' WITH TAG BIT '0'

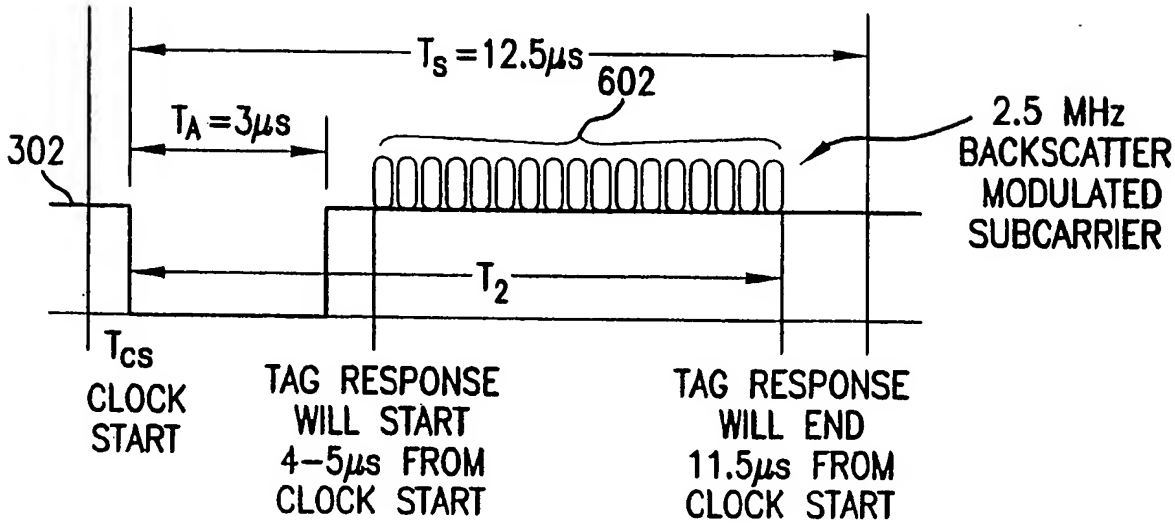

FIG. 6

READER BIT '1' WITH TAG BIT '0'

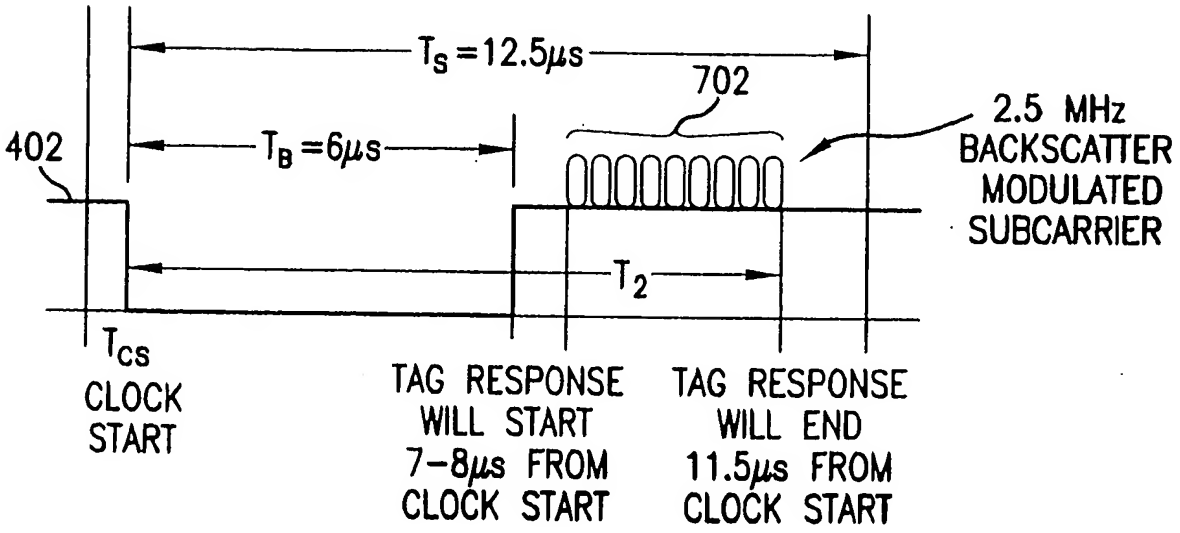

FIG. 7

OIPE IAP13
MAR 22 2006
PATENT & TRADEMARK OFFICE

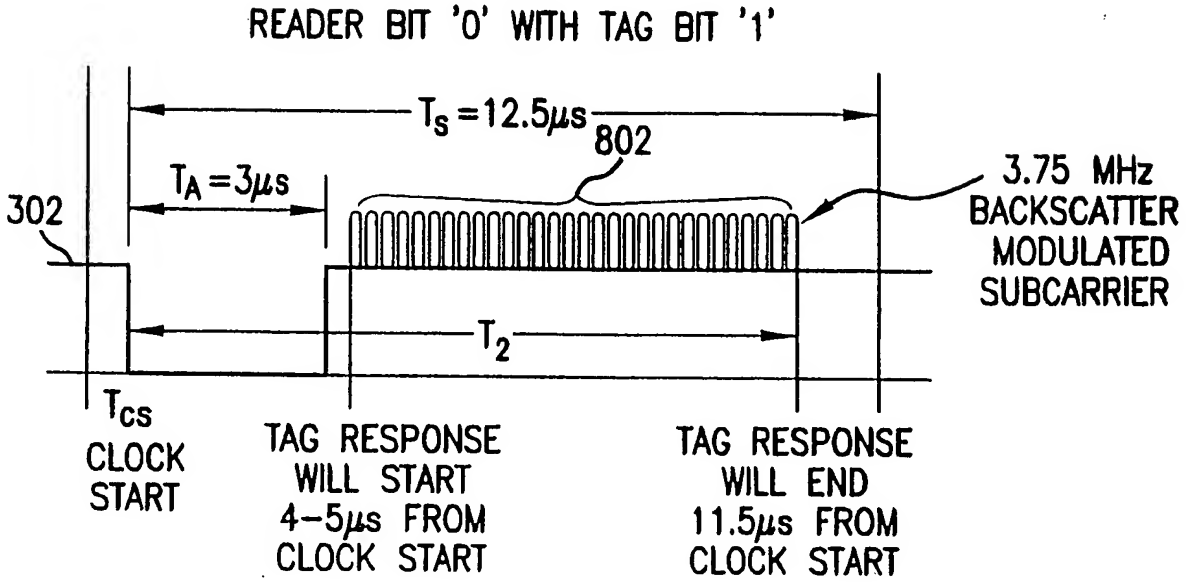

FIG. 8

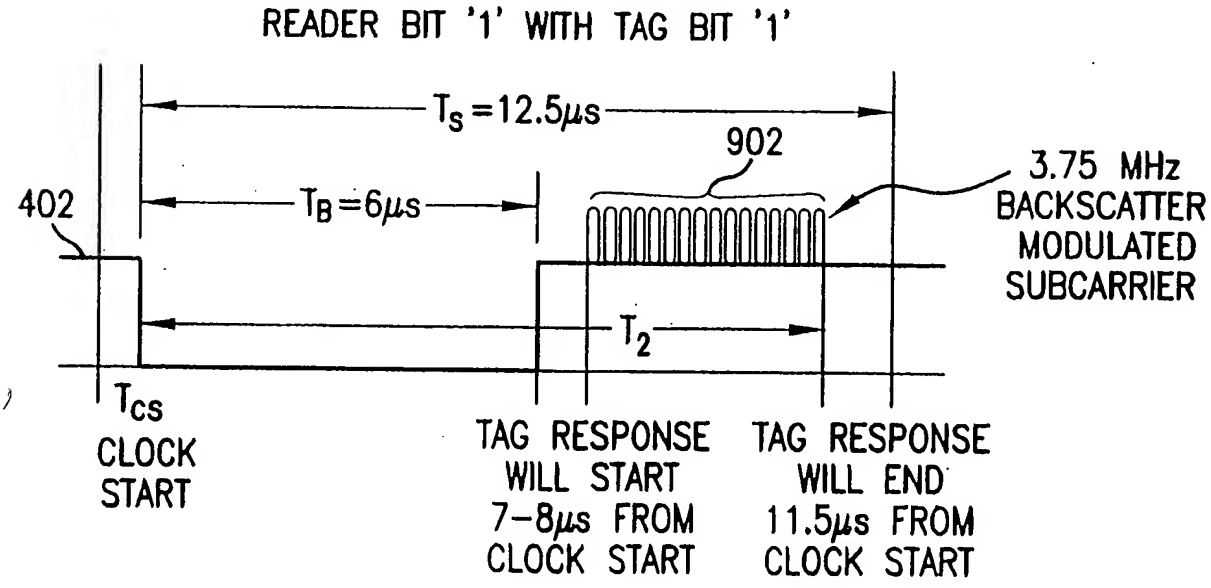

FIG. 9

OIPE IAP13
MAR 22 2006
PATENT & TRADEMARK OFFICE

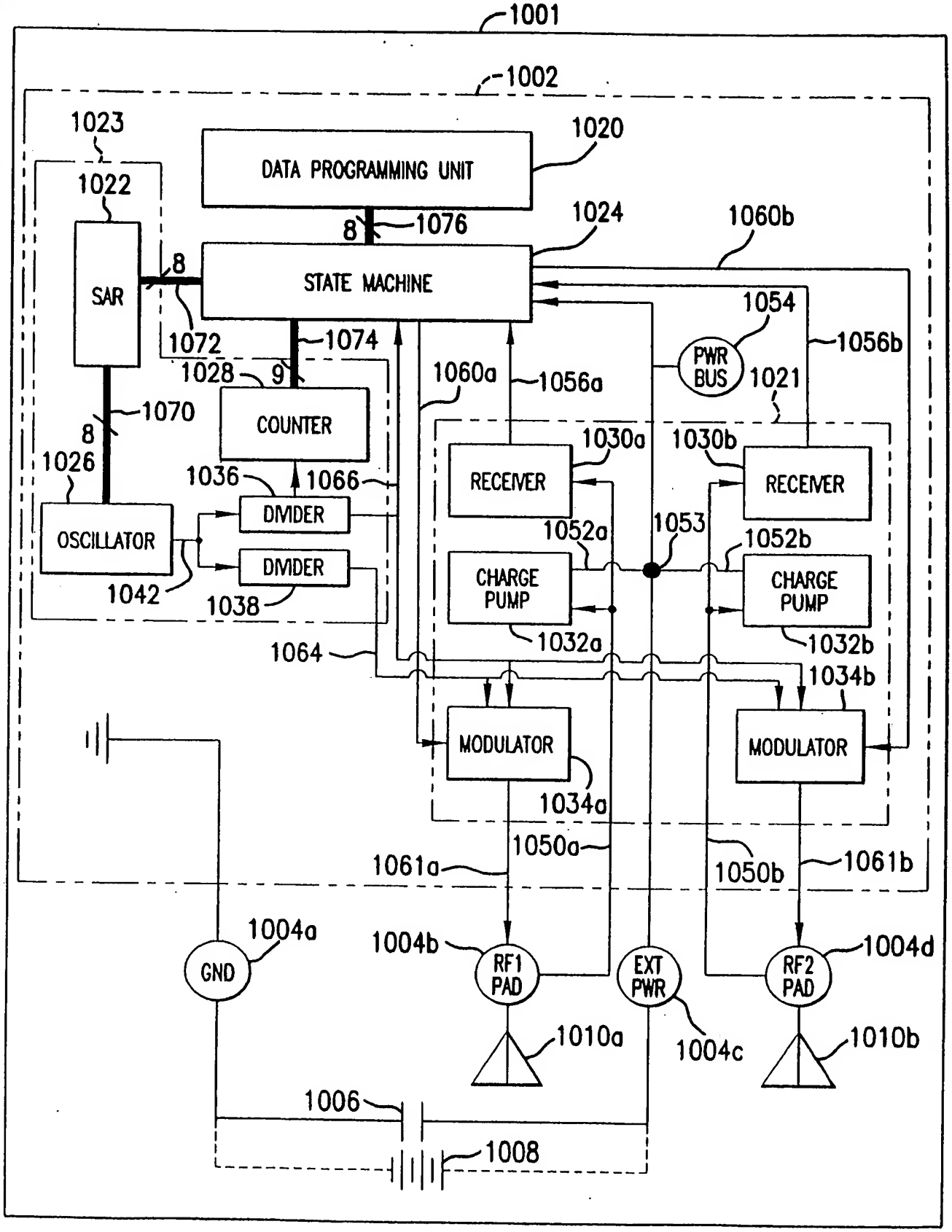

FIG. 10

OIPE · IAP13
MAR 22 2006
PATENT & TRADEMARK OFFICE

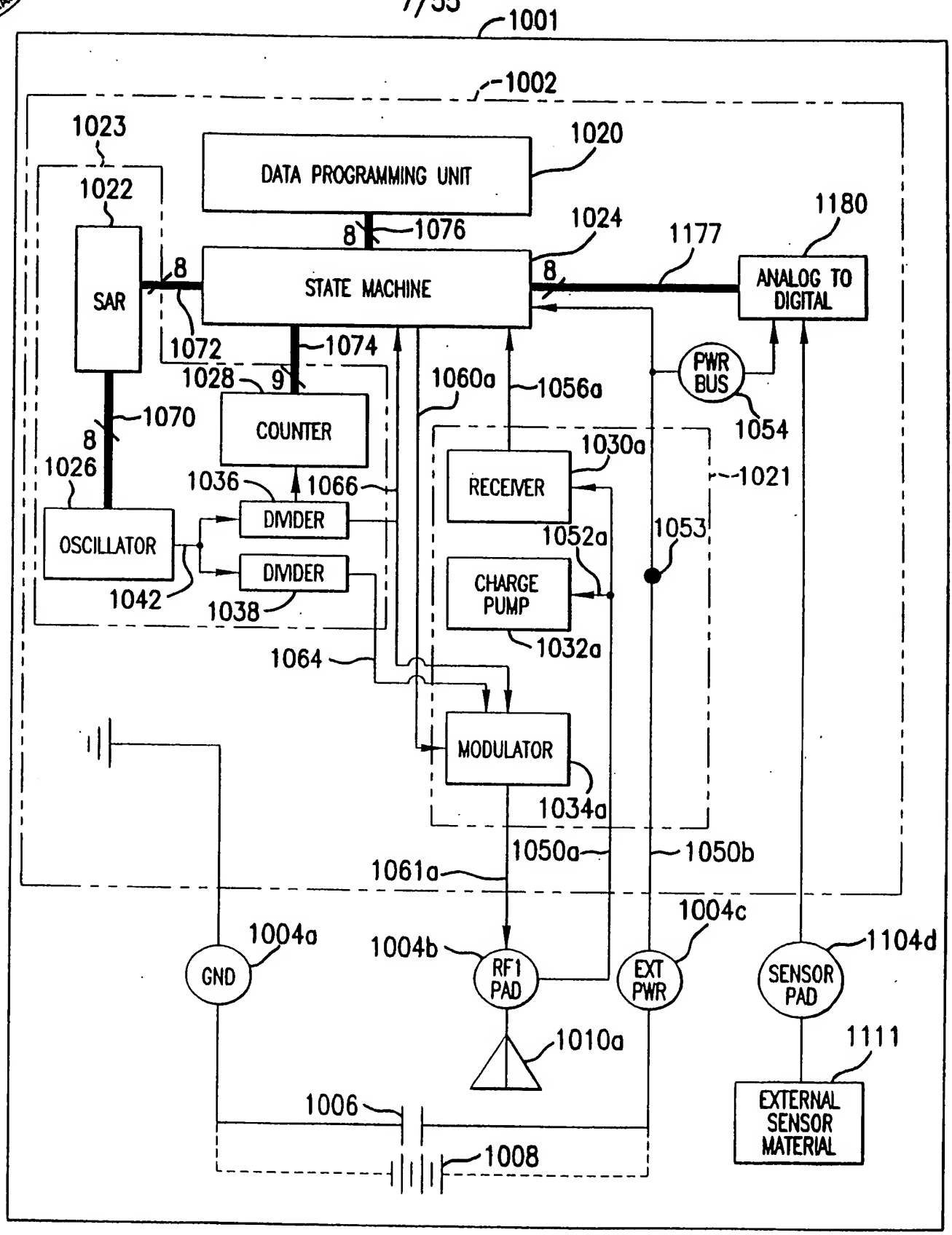

FIG. 11

OIPE IAP13 MAR 22 2006 PATENT & TRADEMARK OFFICE

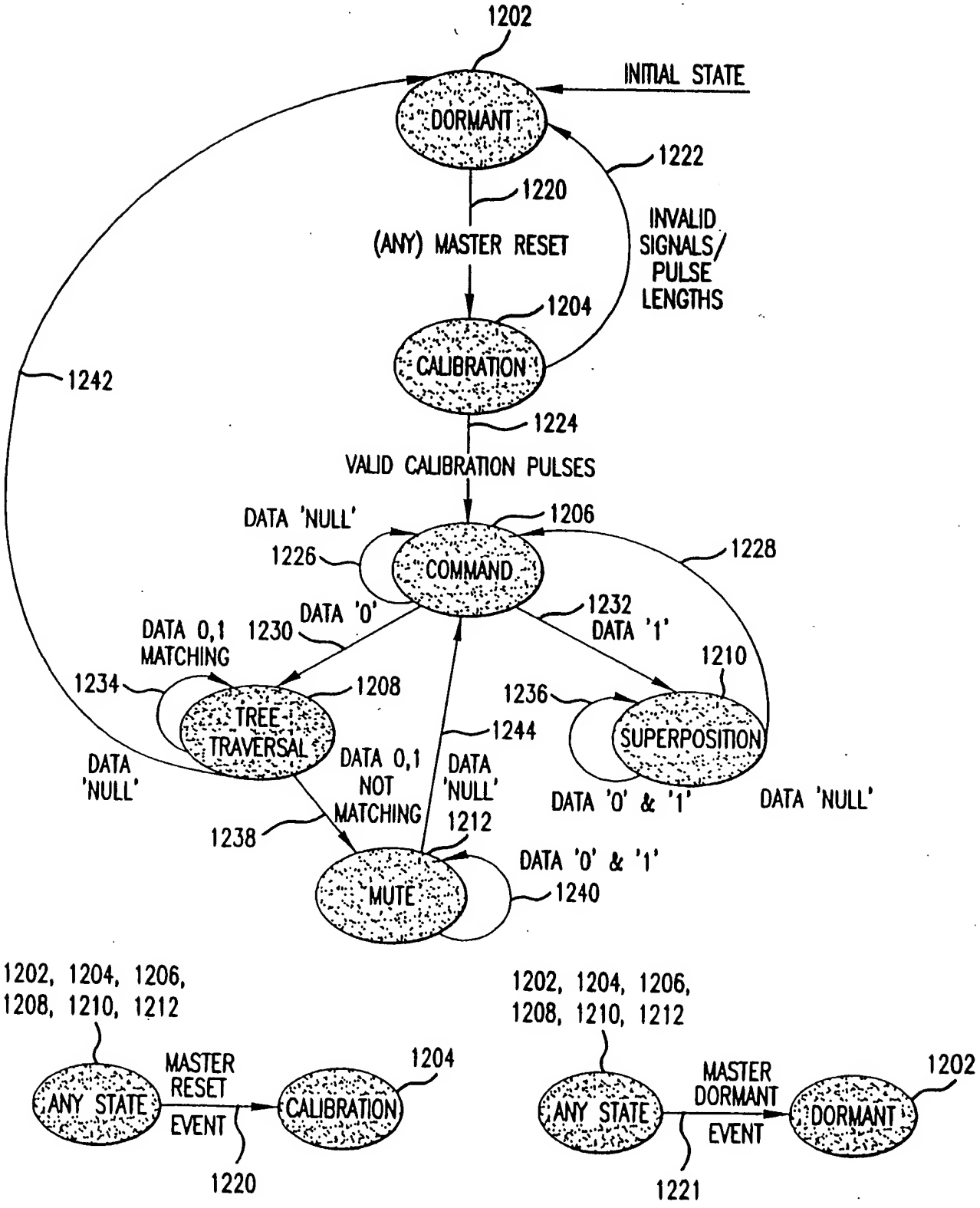

FIG. 12A

OIPE IAP13
MAR 22 2006
PATENT & TRADEMARK OFFICE

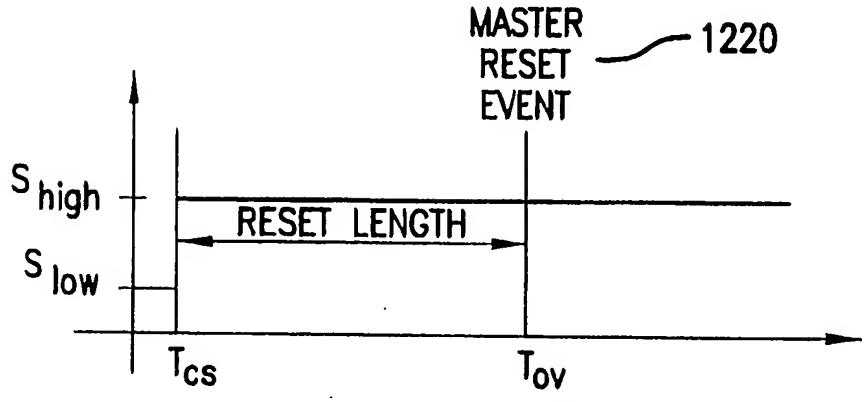

FIG. 12B

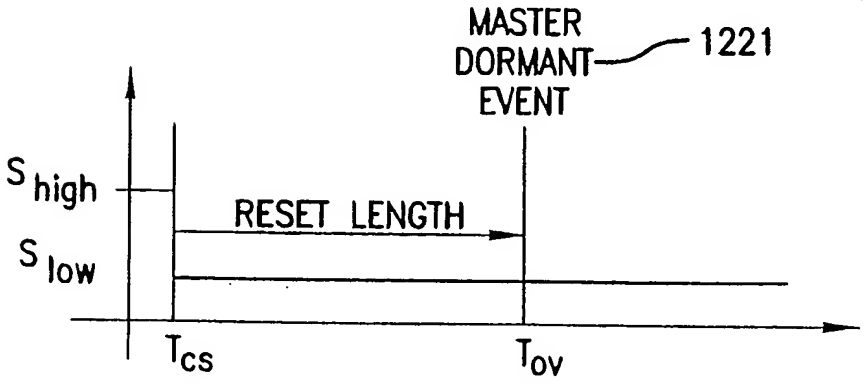

FIG. 12C

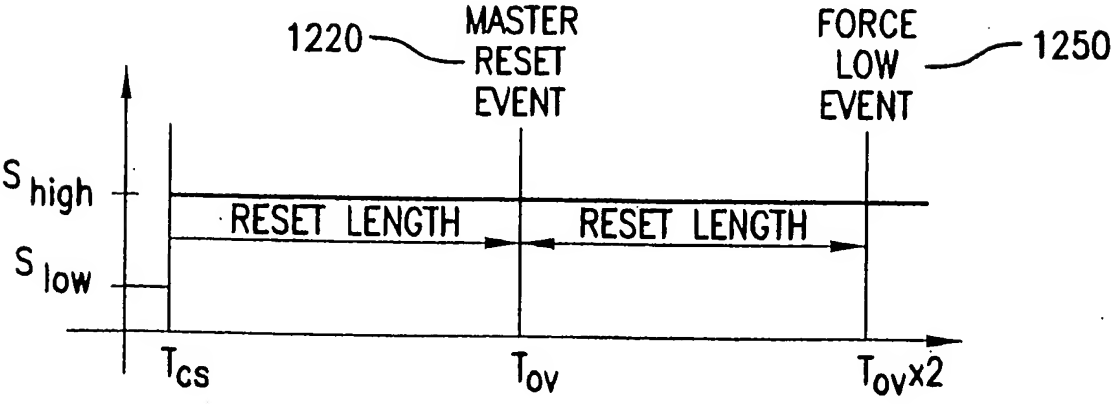

FIG. 12D

OIPE IAP13
MAR 22 2006
PATENT & TRADEMARK OFFICE

Replacement Sheet
Sheet 10 of 55
Appl. No. 10/072,885; Filed: Feb 12, 2002
Dkt No. 1689.0210001; Group Unit: 2636
Inventors: SHANKS et al.
Tel. No.: 202-371-2600
For: Method, System, and Apparatus for Binary Traversal of a Tag Population

BINARY TRAVERSAL FLOWCHART FROM A TAG PERSPECTIVE

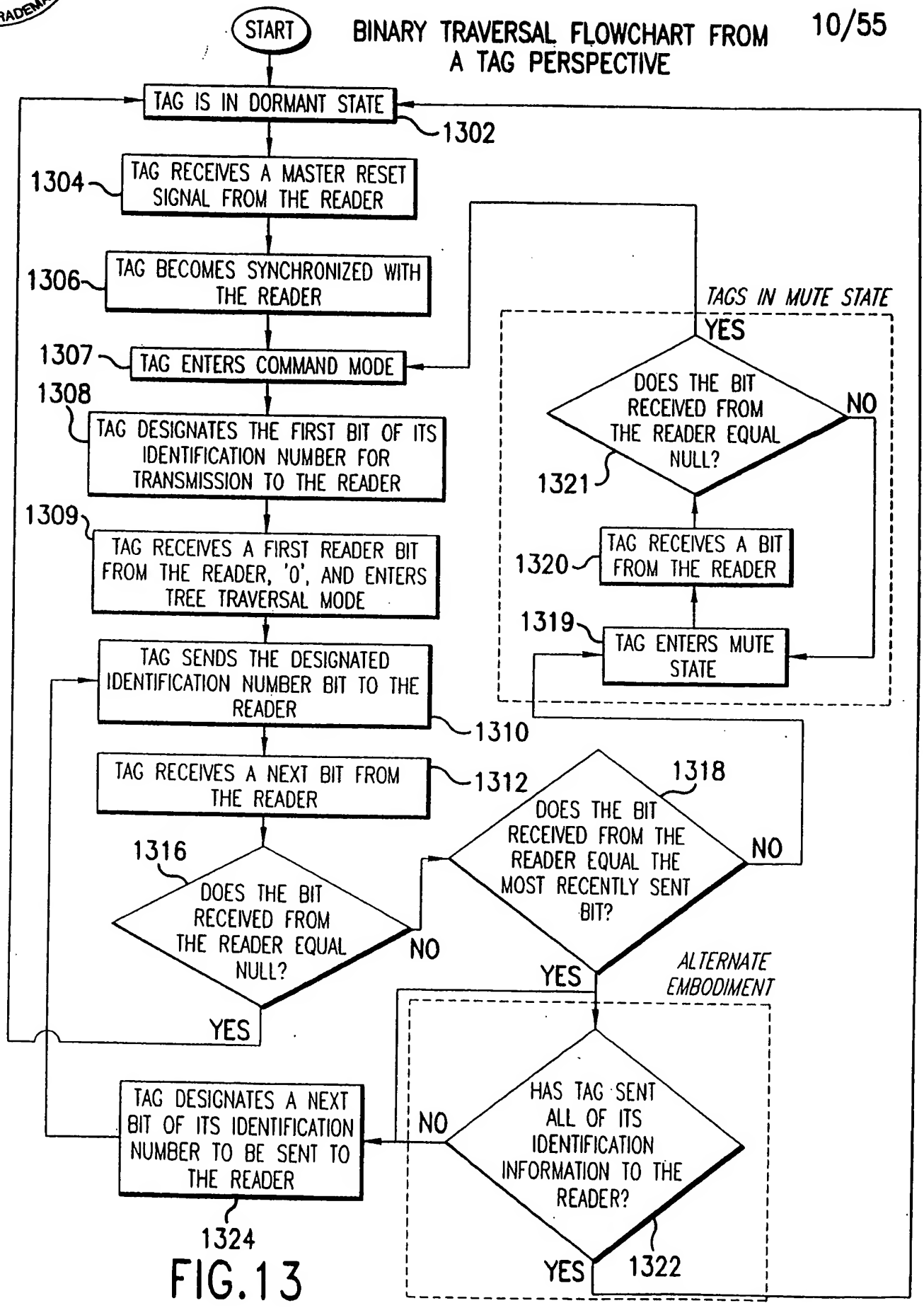

FIG.13

OIPE IAP13 MAR 22 2006 PATENT & TRADEMARK OFFICE

Replacement Sheet
Sheet 11 of 55
Appl. No. 10/072,885; Filed: Feb 12, 2002
Dkt No. 1689.0210001; Group Unit: 2636
Inventors: SHANKS et al.
Tel. No.: 202-371-2600
For: Method, System, and Apparatus for Binary Traversal of a Tag Population

READ SPECIFIC TAG, READER PERSPECTIVE

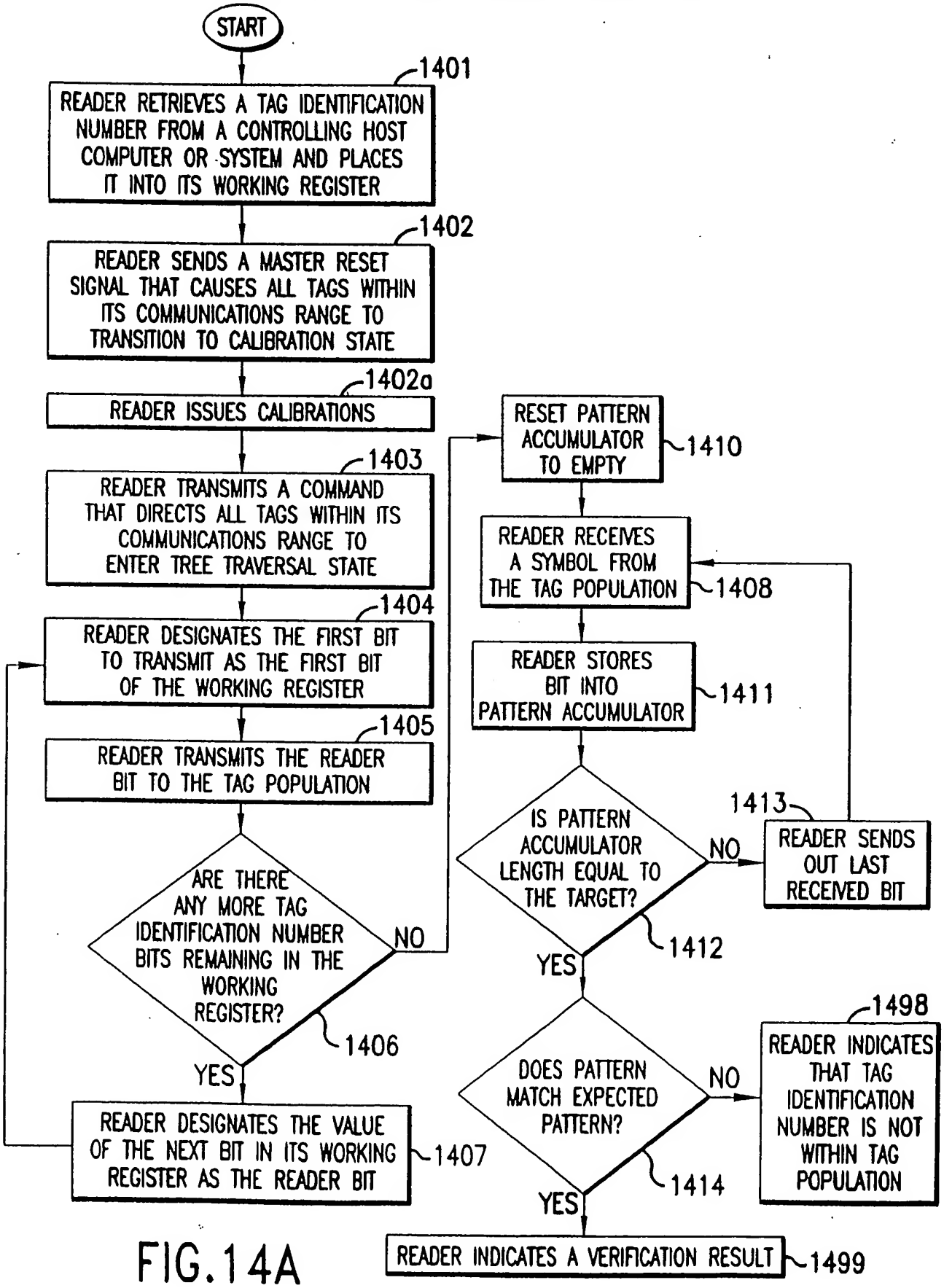

FIG.14A

OIPE IAP13
MAR 22 2006
PATENT & TRADEMARK OFFICE

Replacement Sheet
Sheet 12 of 55
Appl. No. 10/072,885; Filed: Feb 12, 2002
Dkt No. 1689.0210001; Group Unit: 2636
Inventors: SHANKS et al.
Tel. No.: 202-371-2600
For: Method, System, and Apparatus for Binary Traversal of a Tag Population

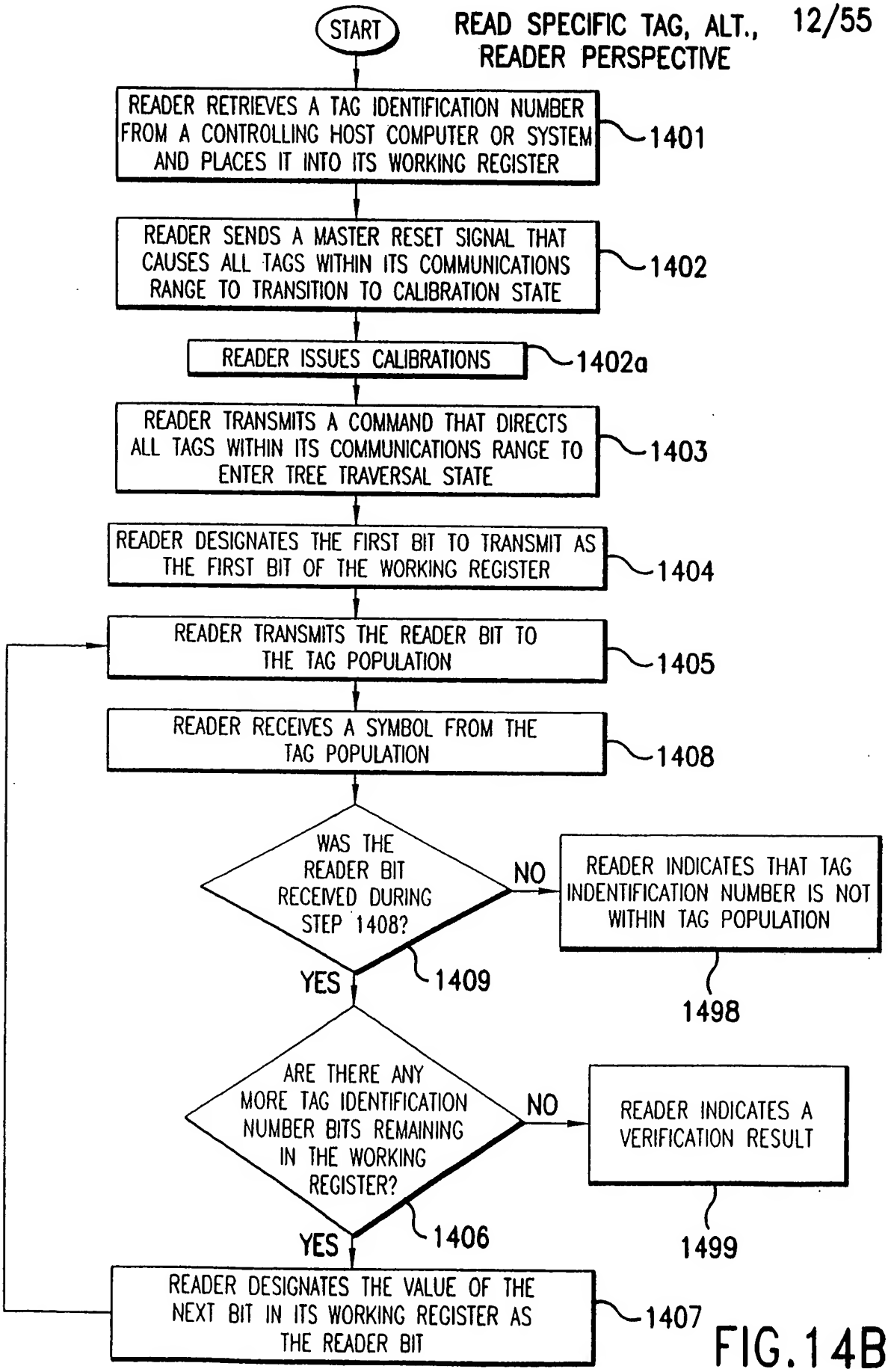

FIG.14B

READ ALL TAGS, READER PERSPECTIVES

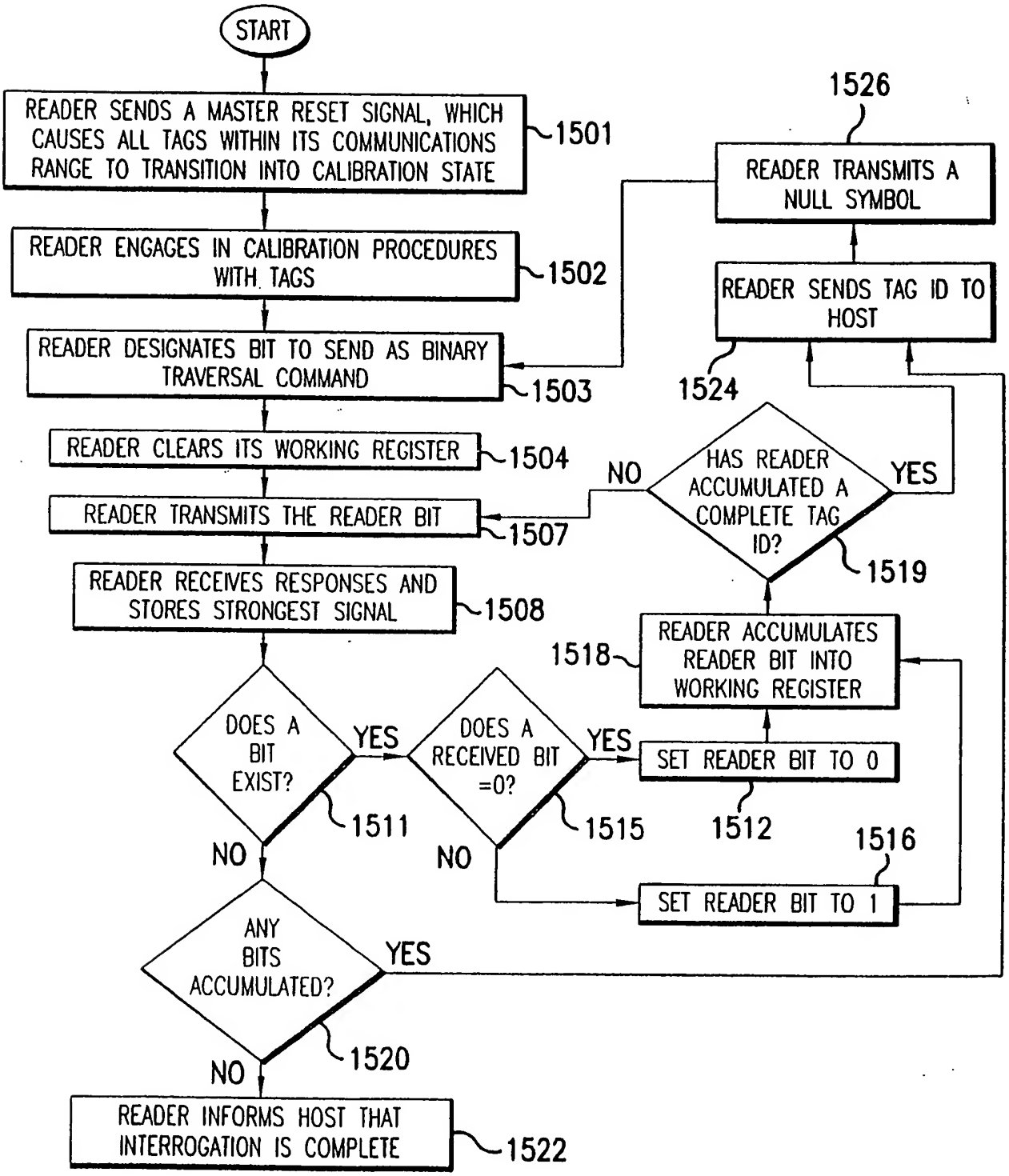

FIG.15A

Replacement Sheet
Sheet 14 of 55
Appl. No. 10/072,885; Filed: Feb 12, 2002
Dkt No. 1689.0210001; Group Unit: 2636
Inventors: SHANKS et al.
Tel. No.: 202-371-2600
For: Method, System, and Apparatus for Binary Traversal of a Tag Population

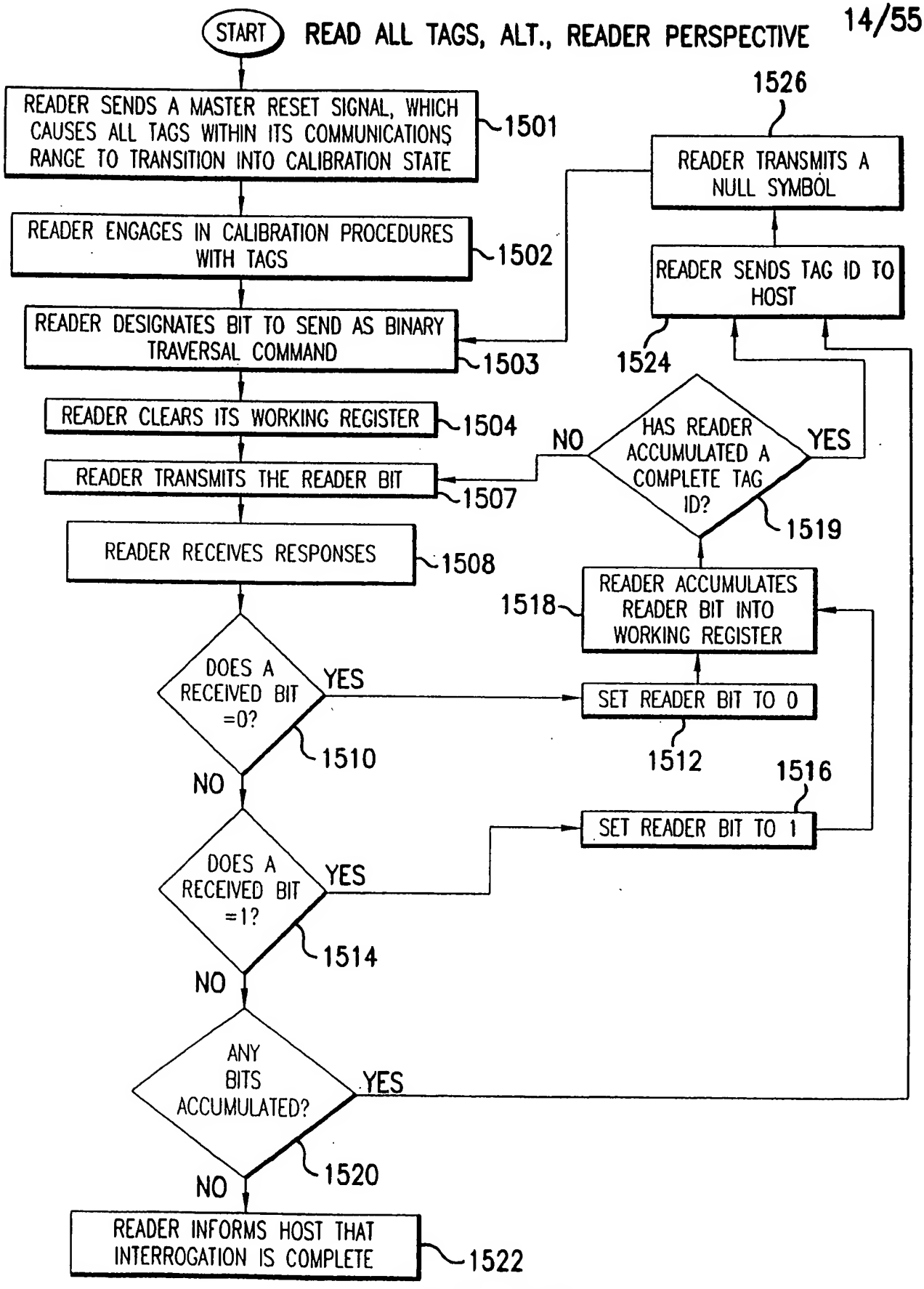

FIG.15B

Replacement Sheet
Sheet 15 of 55
Appl. No. 10/072,885; Filed: Feb 12, 2002
Dkt No. 1689.0210001; Group Unit: 2636
Inventors: SHANKS et al.
Tel. No.: 202-371-2600
For: Method, System, and Apparatus for Binary Traversal
of a Tag Population

BINARY TRAVERAL PATHS AND TREE FOR A 3-BIT TAG POPULATION

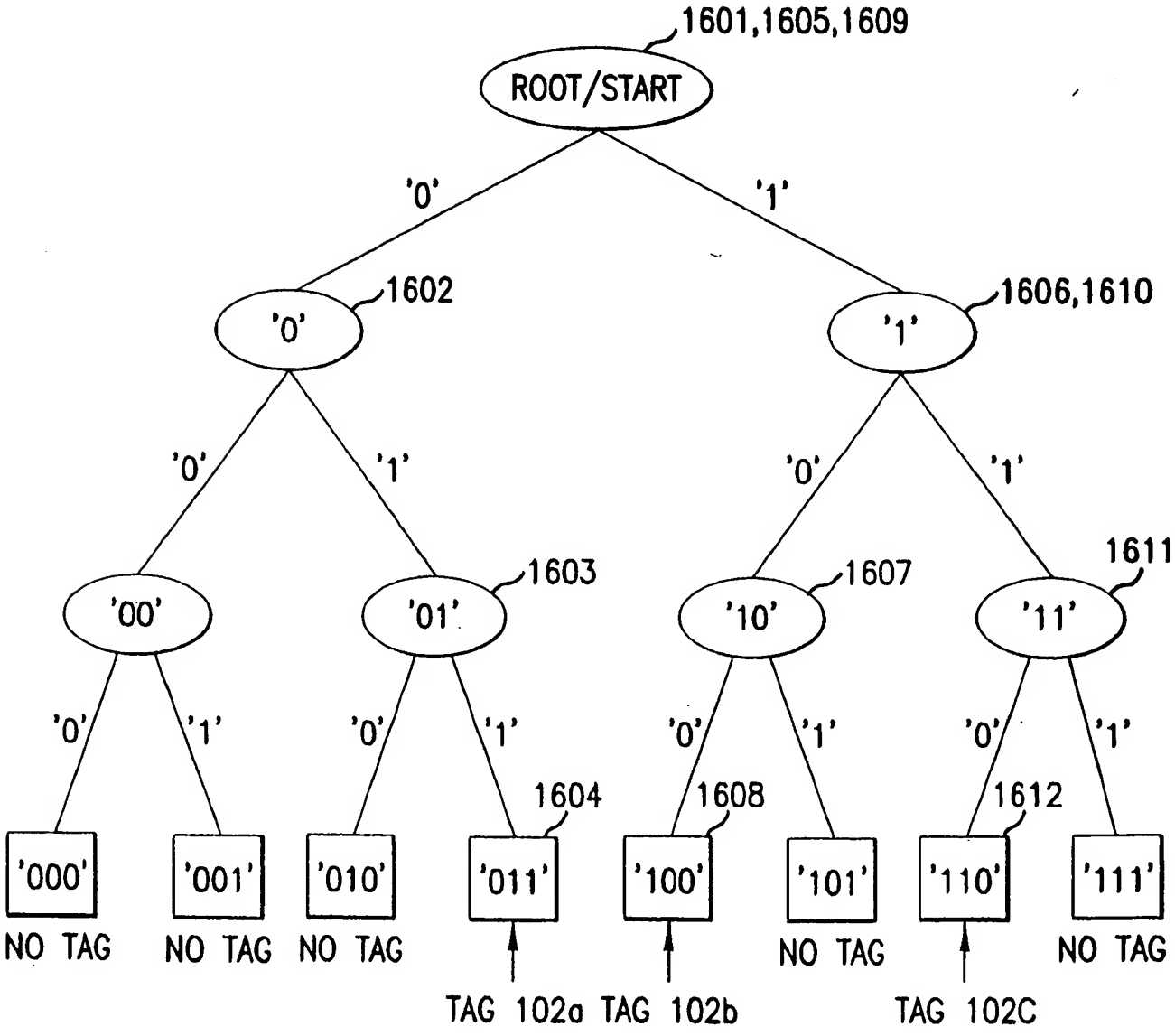

FIG. 16

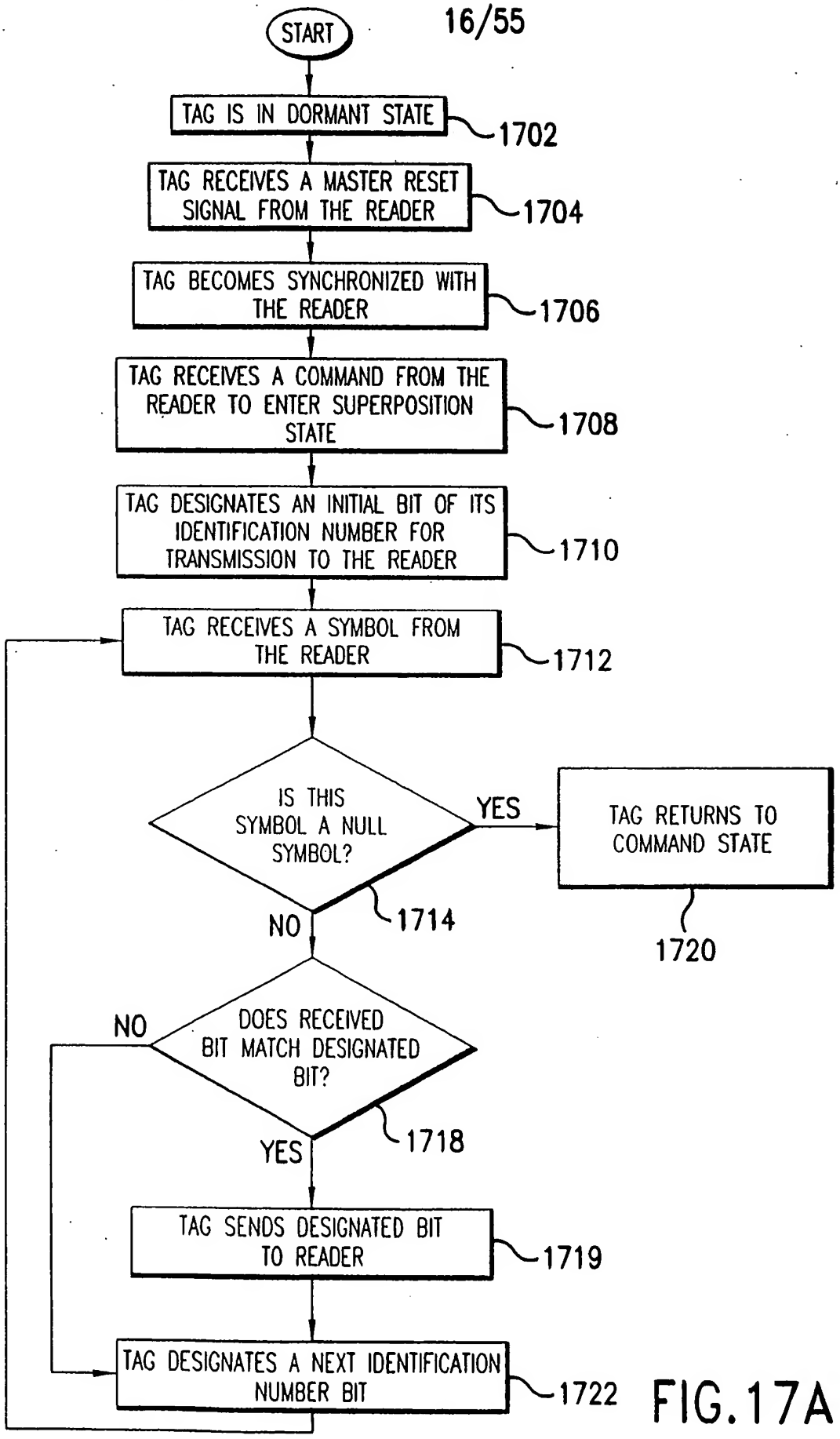
START
TAG IS IN DORMANT STATE
1702
TAG RECEIVES A MASTER RESET SIGNAL FROM THE READER
1704
TAG BECOMES SYNCHRONIZED WITH THE READER
1706
TAG RECEIVES A COMMAND FROM THE READER TO ENTER SUPERPOSITION STATE
1708
TAG DESIGNATES AN INITIAL BIT OF ITS IDENTIFICATION NUMBER FOR TRANSMISSION TO THE READER
1710
TAG RECEIVES A SYMBOL FROM THE READER
1712
IS THIS SYMBOL A NULL SYMBOL?
YES
TAG RETURNS TO COMMAND STATE
1720
1714
NO
DOES RECEIVED BIT MATCH DESIGNATED BIT?
NO
1718
YES
TAG SENDS DESIGNATED BIT TO READER
1719
TAG DESIGNATES A NEXT IDENTIFICATION NUMBER BIT
1722

FIG.17A

Replacement Sheet
Sheet 17 of 55
Appl. No. 10/072,885; Filed: Feb 12, 2002
Dkt No. 1689.0210001; Group Unit: 2636
Inventors: SHANKS et al.
Tel. No.: 202-371-2600
For: Method, System, and Apparatus for Binary Traversal
of a Tag Population

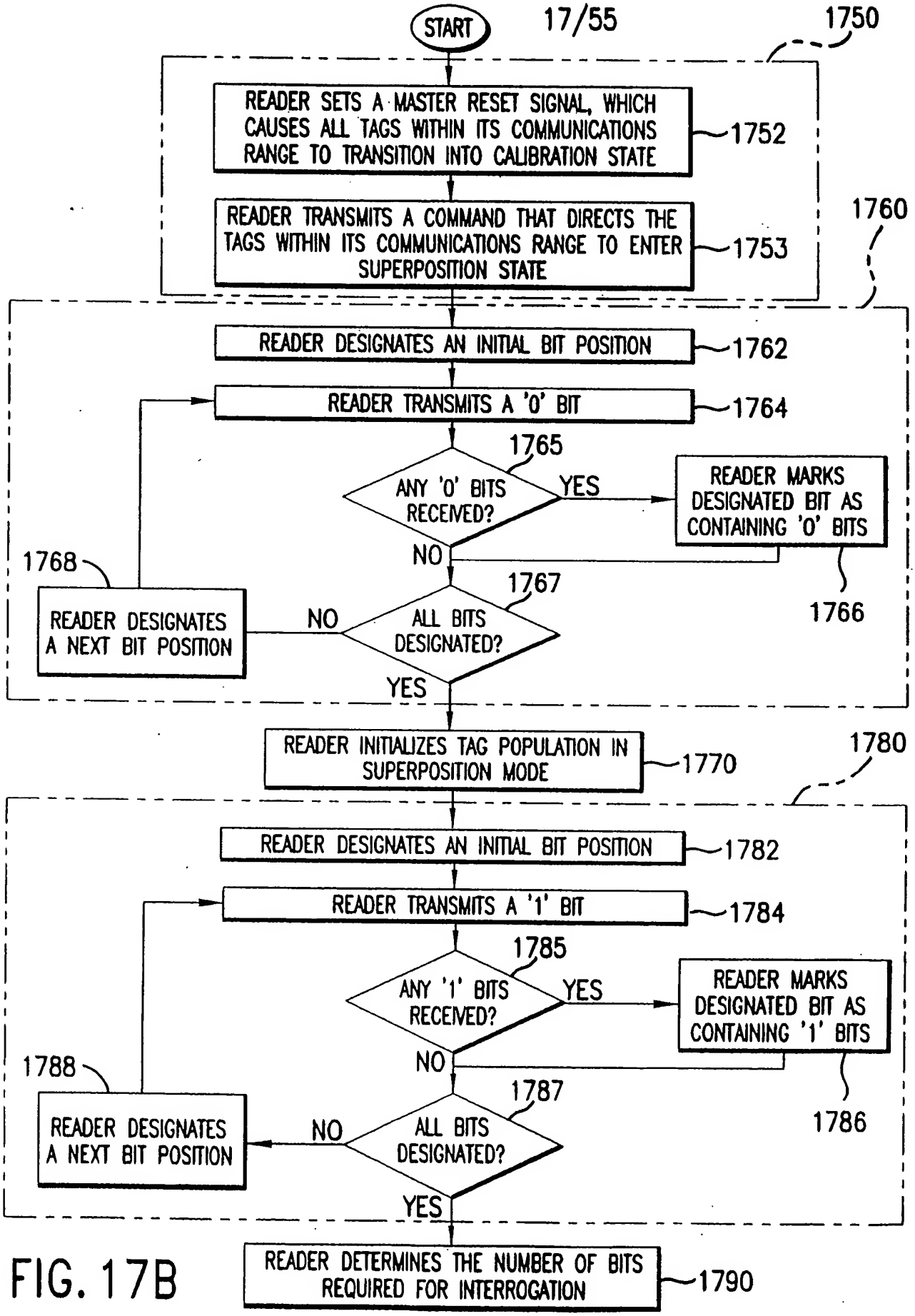

FIG. 17B

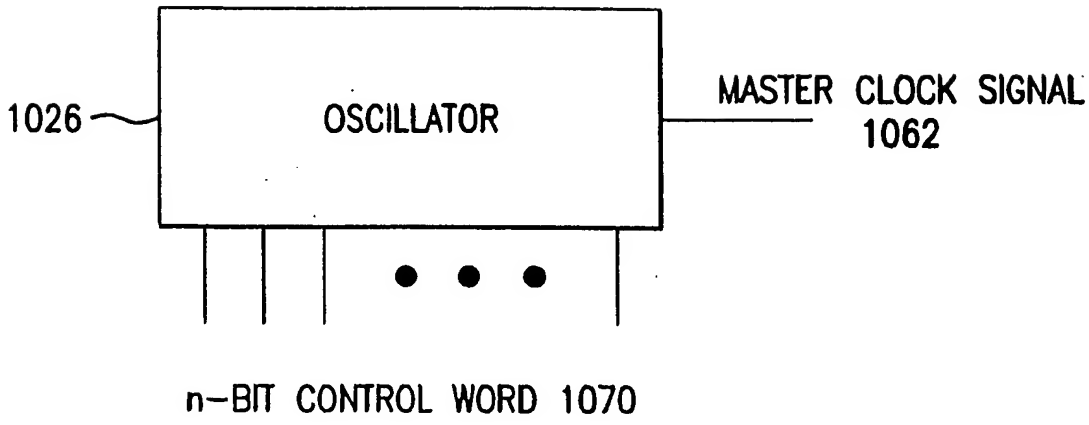
1026
OSCILLATOR
MASTER CLOCK SIGNAL
1062
n-BIT CONTROL WORD 1070

FIG. 18

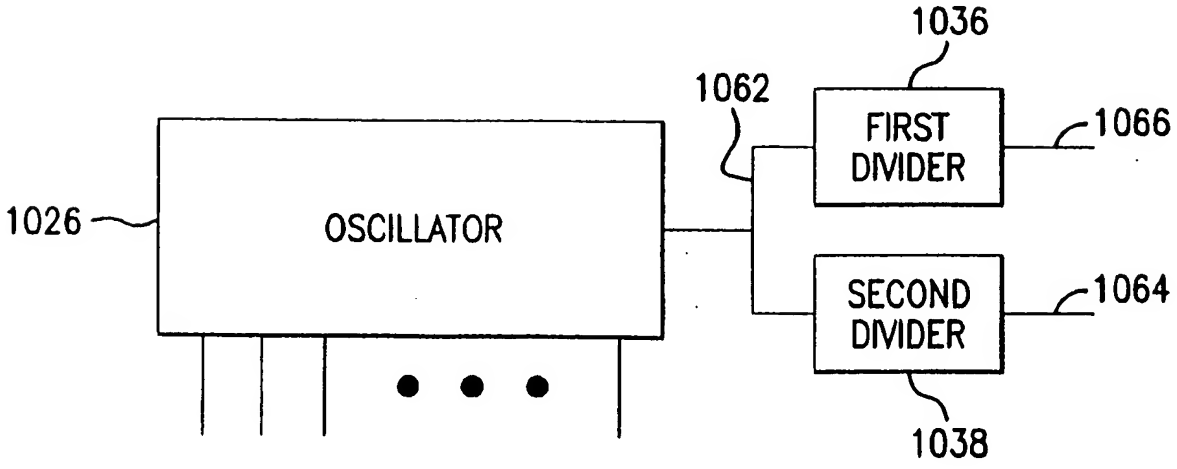
1036
1062
FIRST
DIVIDER
1066
1026
OSCILLATOR
SECOND
DIVIDER
1064
1038
n-BIT CONTROL WORD 1070

FIG. 19

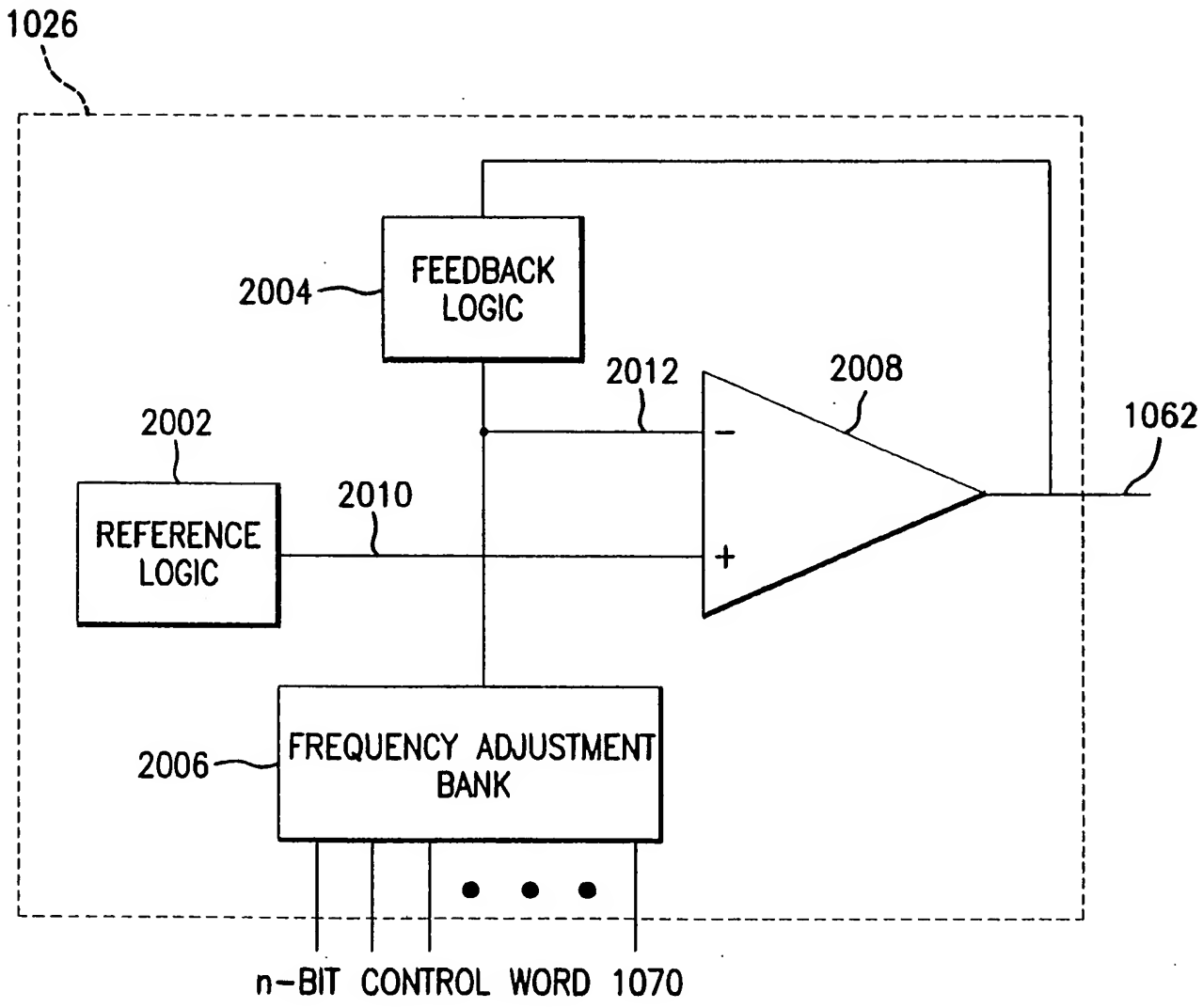
1026
2004
FEEDBACK LOGIC
2012
2008
1062
2002
REFERENCE LOGIC
2010
2006
FREQUENCY ADJUSTMENT BANK
n-BIT CONTROL WORD 1070

FIG. 20

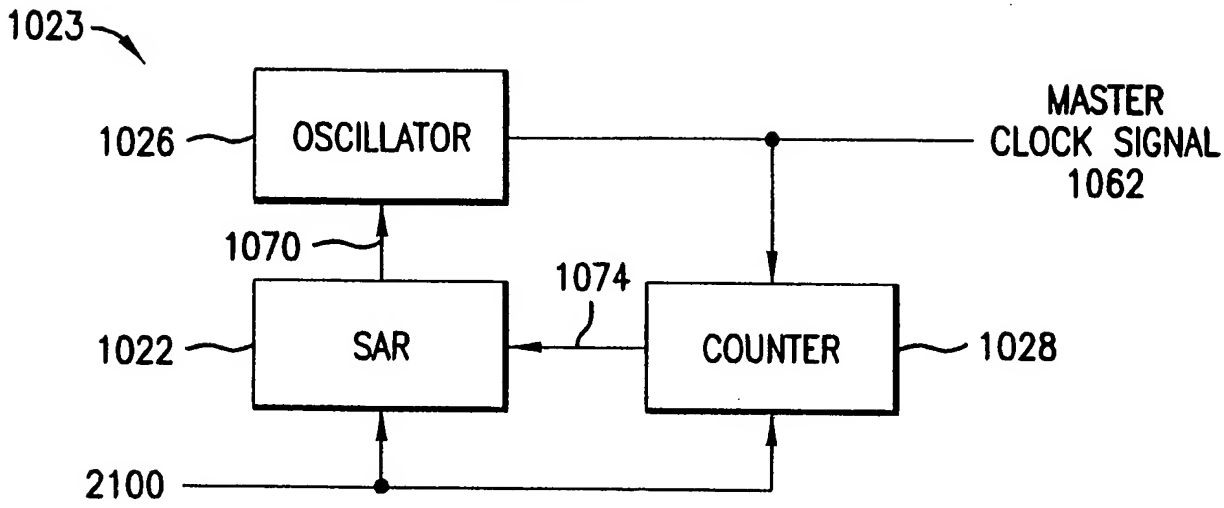

FIG. 21A

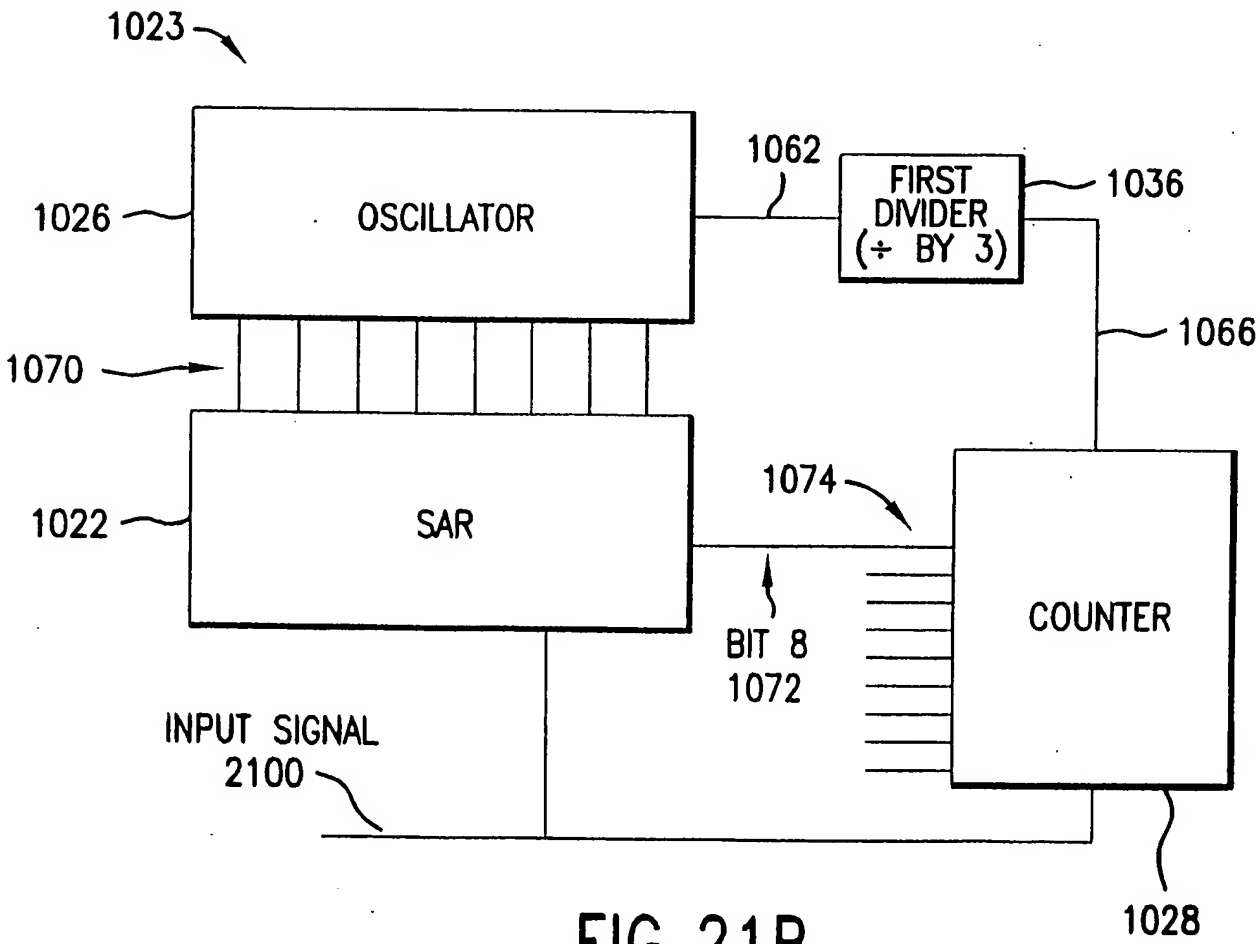

FIG. 21B

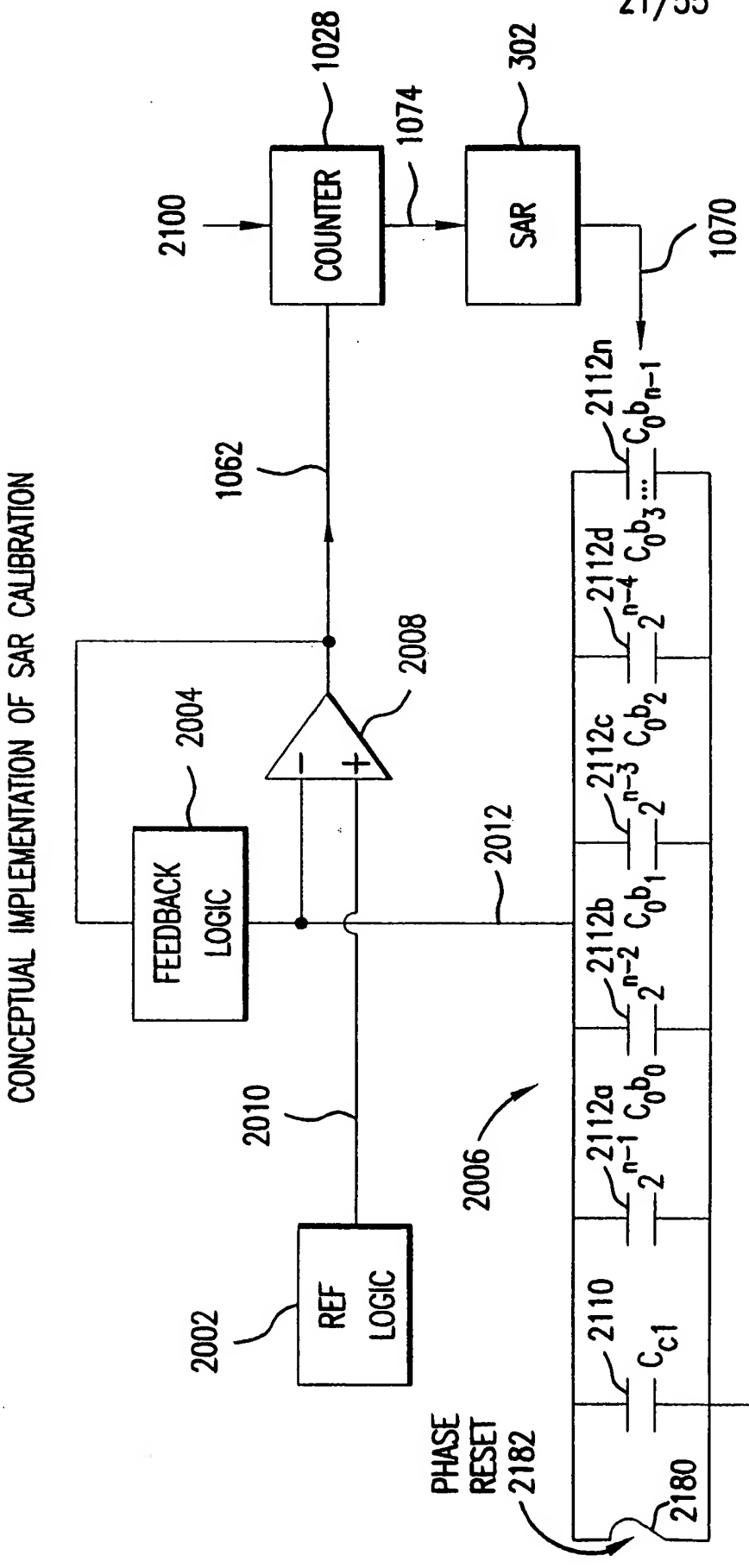
CONCEPTUAL IMPLEMENTATION OF SAR CALIBRATION
2100
COUNTER
1028
1074
SAR
302
1070
1062
2112n
C_0b_{n-1}
2112d
2^{n-4}
C_0b_3
2112c
2^{n-3}
C_0b_2
2112b
2^{n-2}
C_0b_1
2112a
2^{n-1}
C_0b_0
2110
C_{c1}
2008
2004
FEEDBACK LOGIC
2012
2010
2006
2002
REF LOGIC
PHASE RESET 2182
2180

FIG. 21C

PHYSICAL IMPLEMENTATION OF ADJUSTABLE CAPACITOR BANK

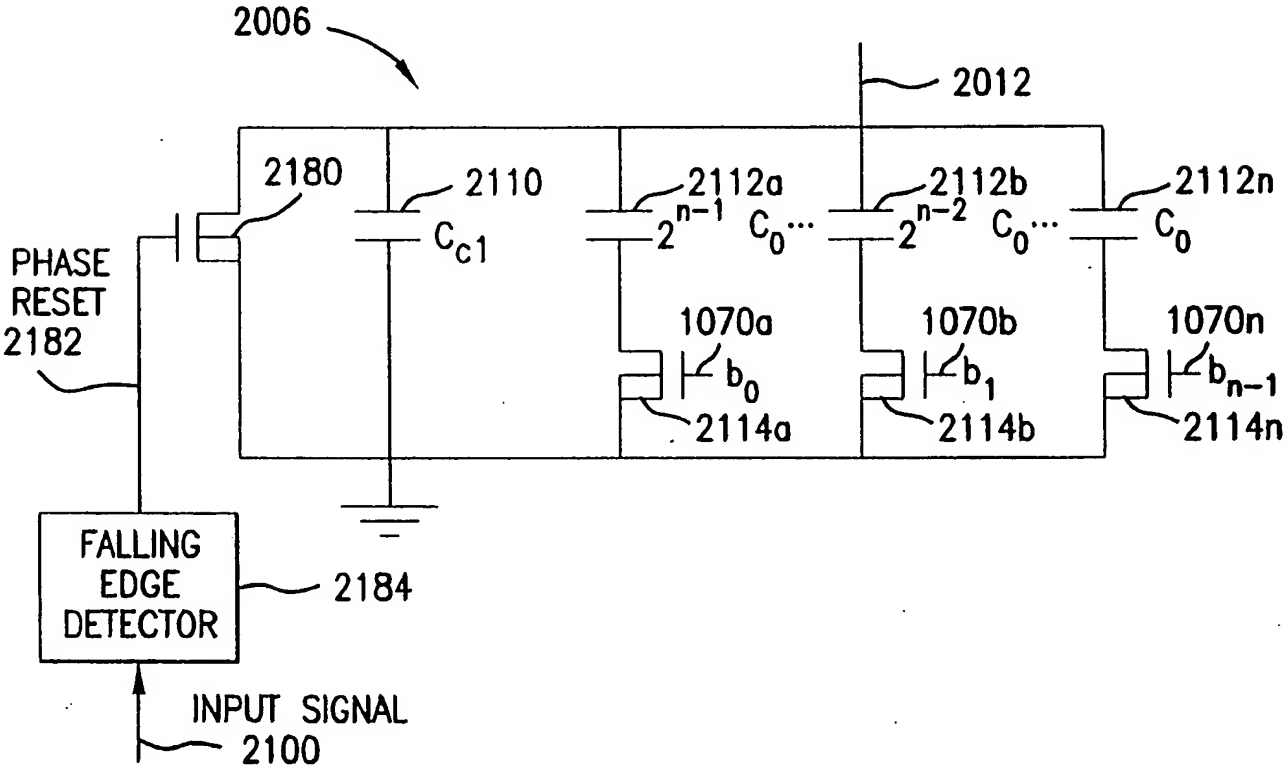

FIG. 21D

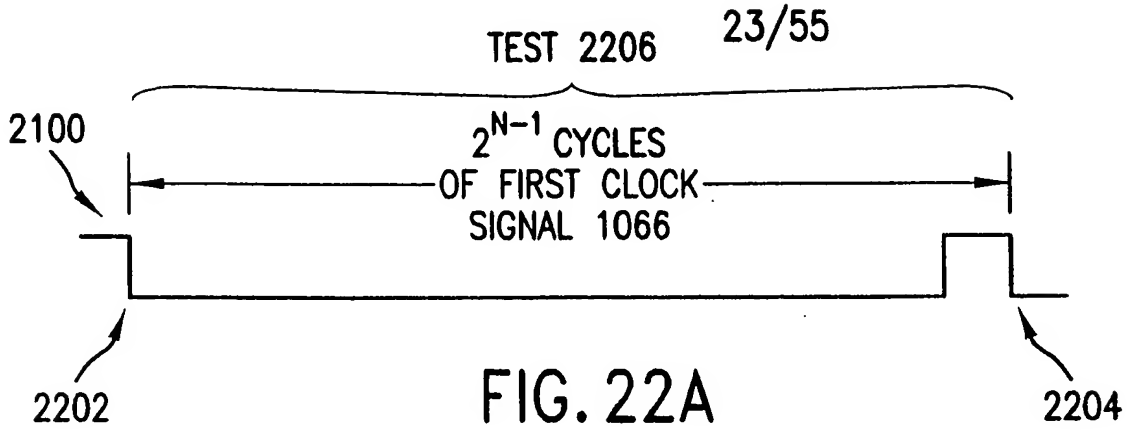

FIG. 22A

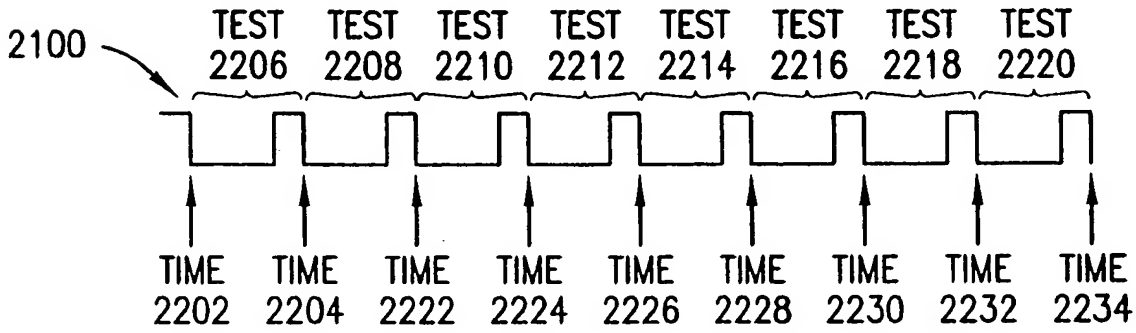

FIG. 22B

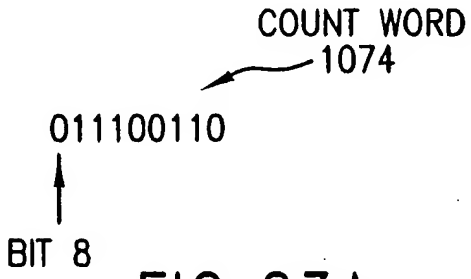

FIG. 23A

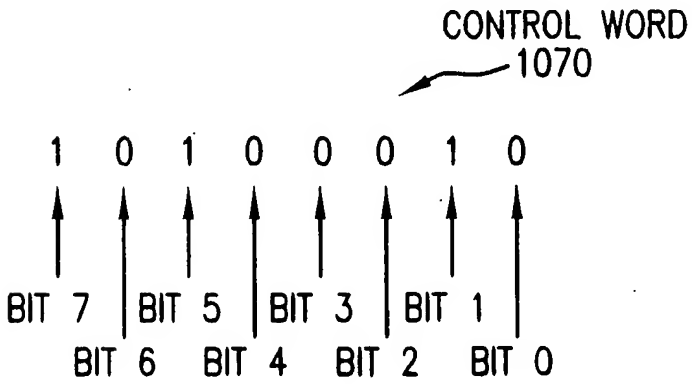

FIG. 23B

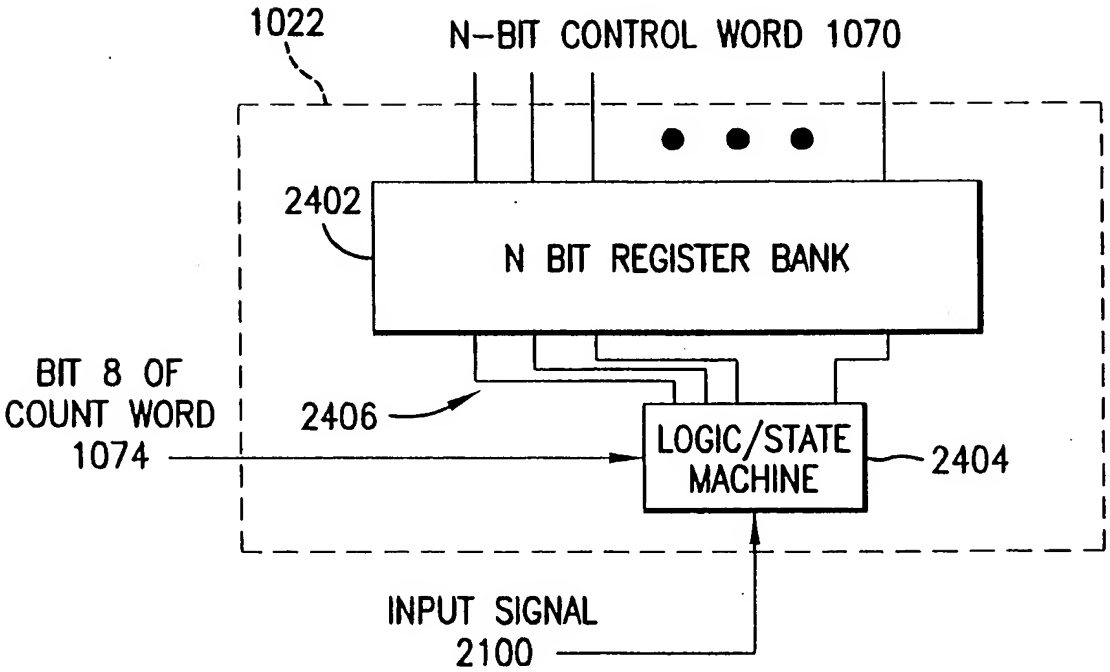
1022
N-BIT CONTROL WORD 1070
2402
N BIT REGISTER BANK
BIT 8 OF
COUNT WORD
1074
2406
LOGIC/STATE
MACHINE
2404
INPUT SIGNAL
2100

FIG. 24

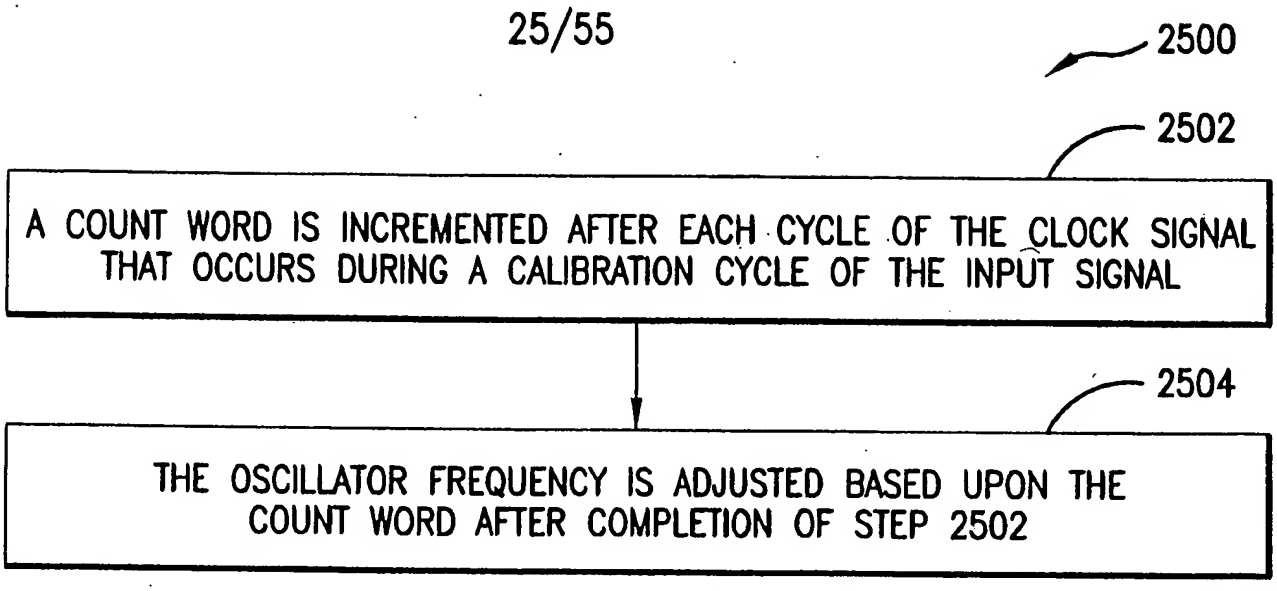

FIG. 25A

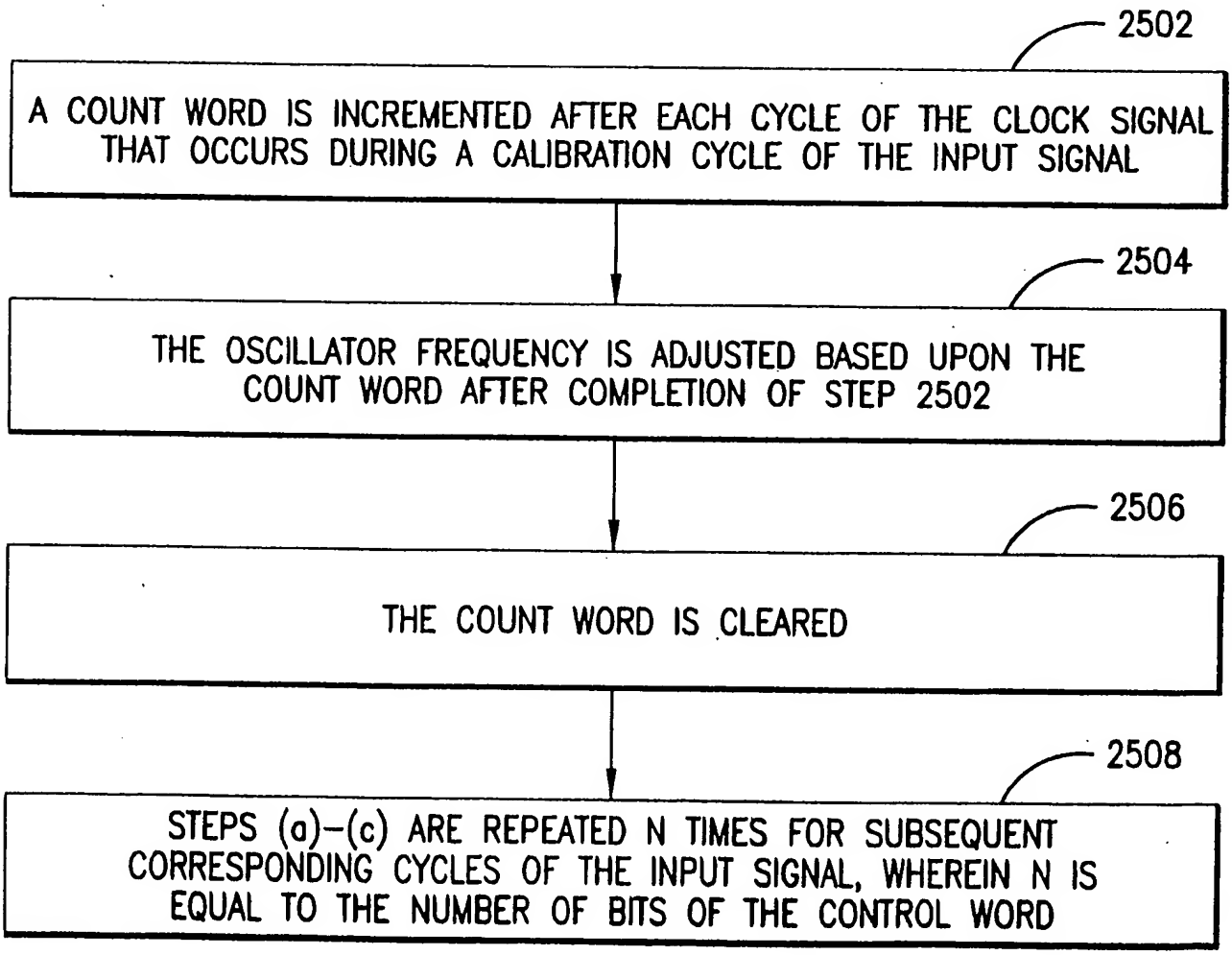

FIG. 25B

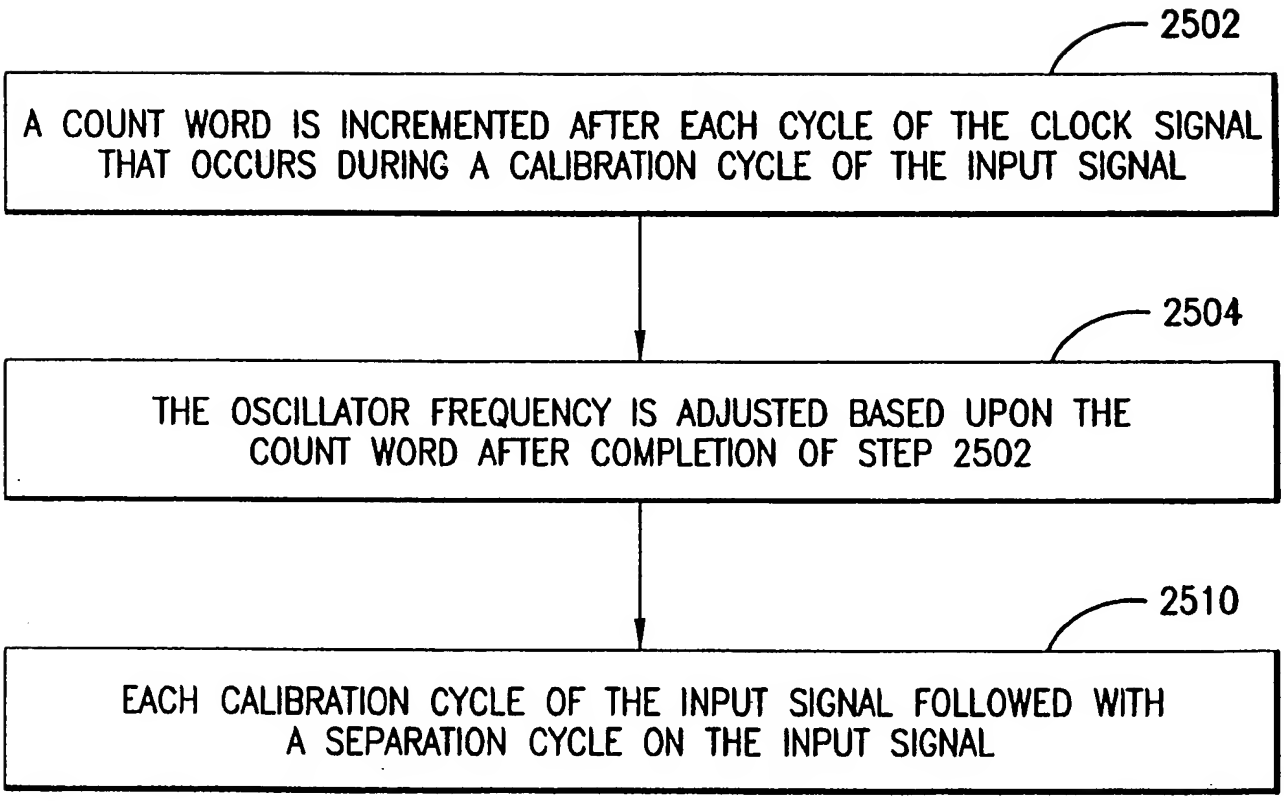
2502
A COUNT WORD IS INCREMENTED AFTER EACH CYCLE OF THE CLOCK SIGNAL THAT OCCURS DURING A CALIBRATION CYCLE OF THE INPUT SIGNAL
2504
THE OSCILLATOR FREQUENCY IS ADJUSTED BASED UPON THE COUNT WORD AFTER COMPLETION OF STEP 2502
2510
EACH CALIBRATION CYCLE OF THE INPUT SIGNAL FOLLOWED WITH A SEPARATION CYCLE ON THE INPUT SIGNAL

FIG. 25C

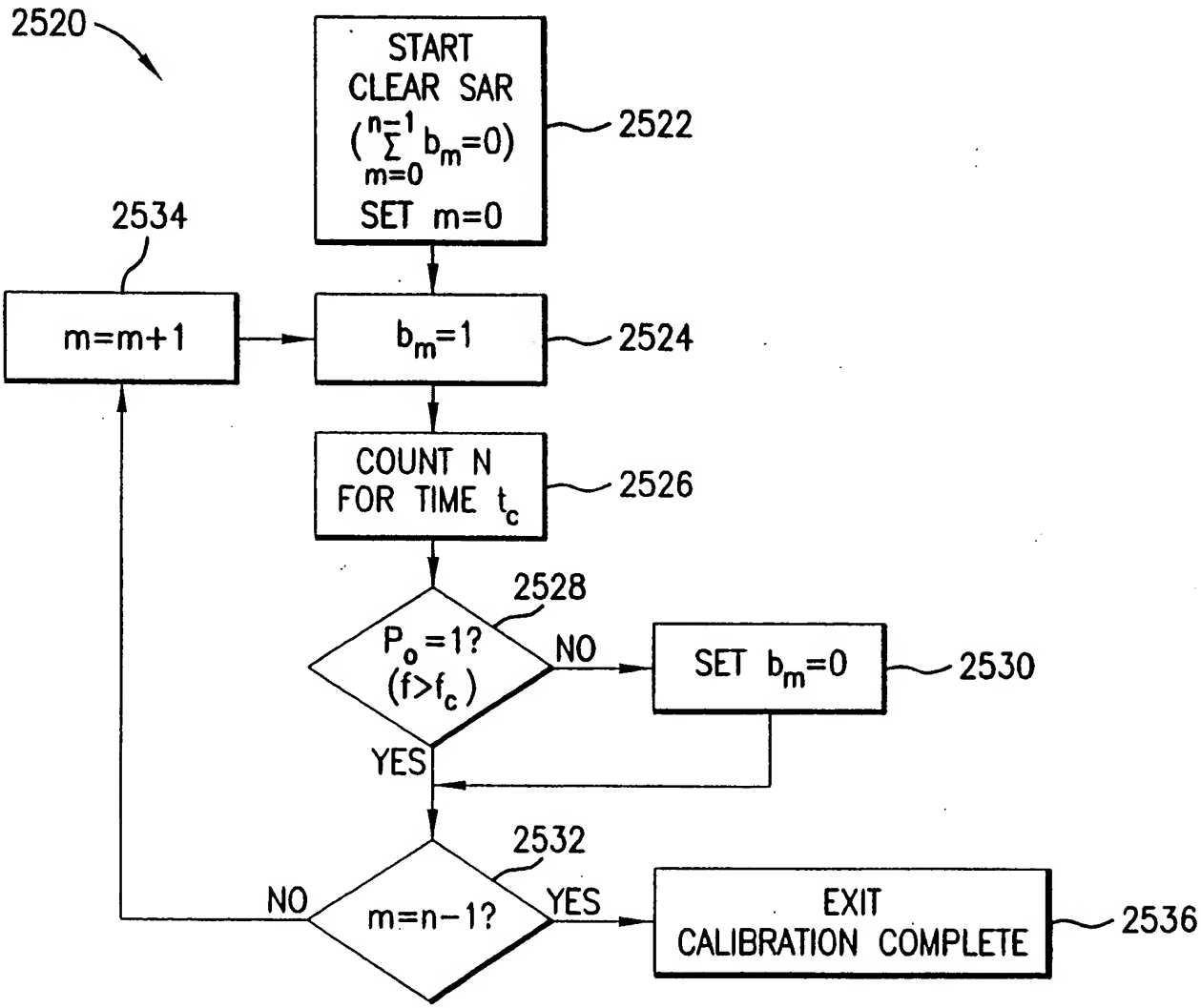
2520
START
CLEAR SAR
($\sum_{m=0}^{n-1} b_m=0$)
SET m=0
2522
2534
m=m+1
$b_m=1$
2524
COUNT N
FOR TIME t_c
2526
2528
$P_o=1?$
($f>f_c$)
NO
SET $b_m=0$
2530
YES
2532
NO
m=n-1?
YES
EXIT
CALIBRATION COMPLETE
2536

FIG. 25D

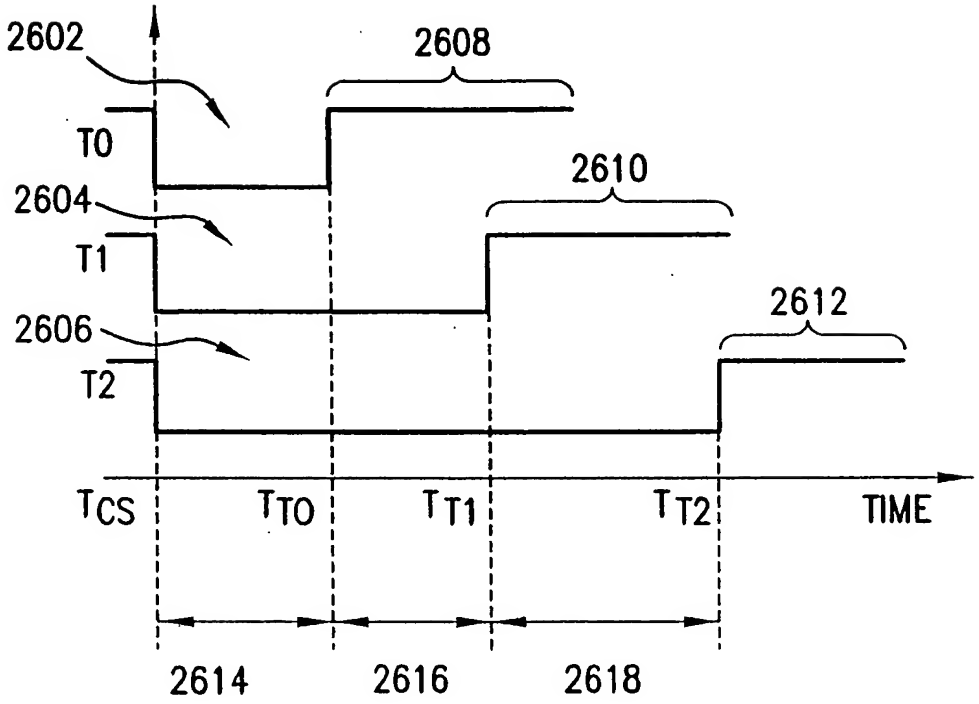
2602
2608
T0
2610
2604
T1
2612
2606
T2
TCS
TTO
TT1
TT2
TIME
2614
2616
2618

FIG.26A

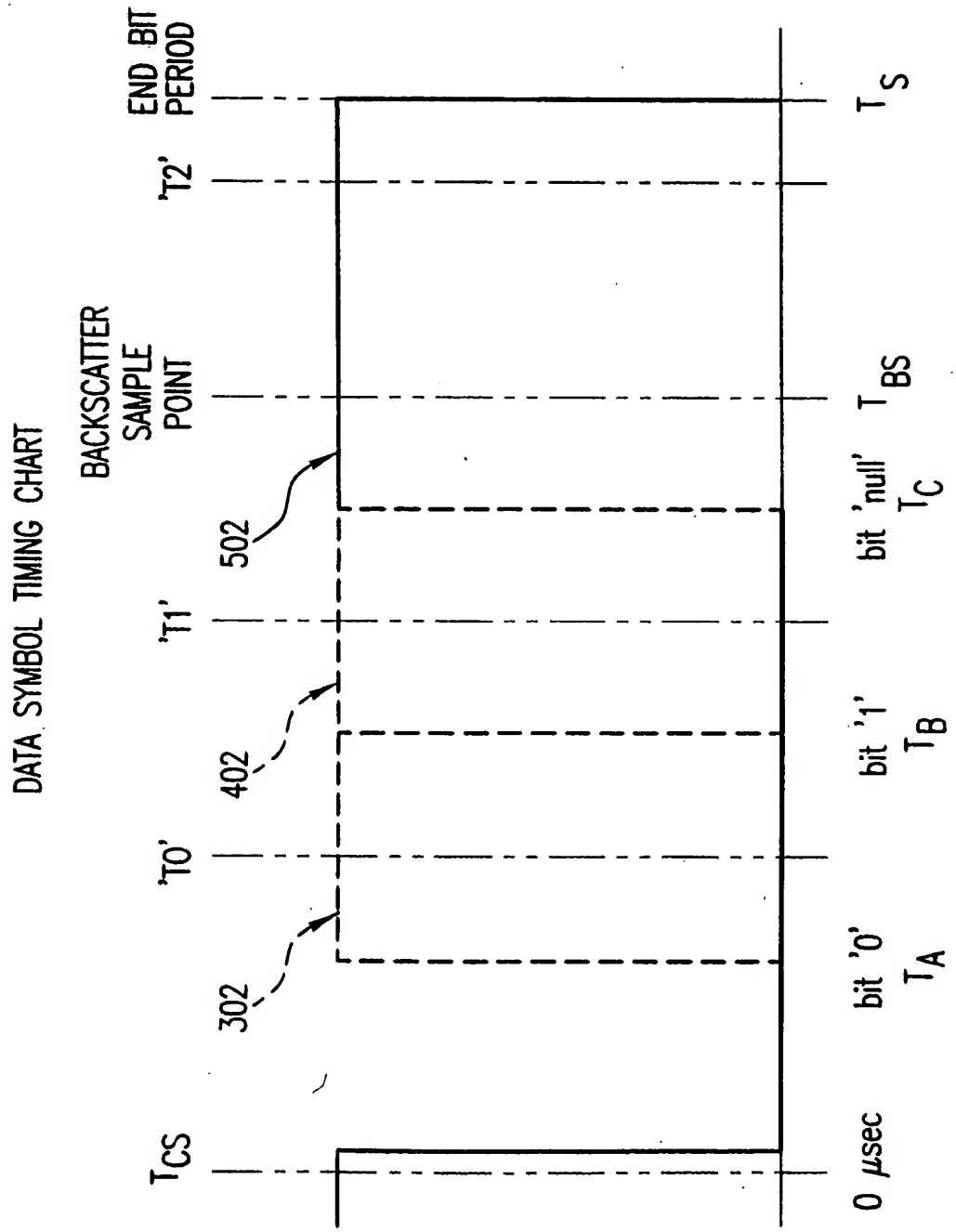
DATA SYMBOL TIMING CHART
BACKSCATTER SAMPLE POINT
END BIT PERIOD
'T2'
'T1'
'T0'
T_{CS}
T_S
T_{BS}
T_C
T_B
T_A
0 μsec
bit 'null'
bit '1'
bit '0'
502
402
302

FIG.26B

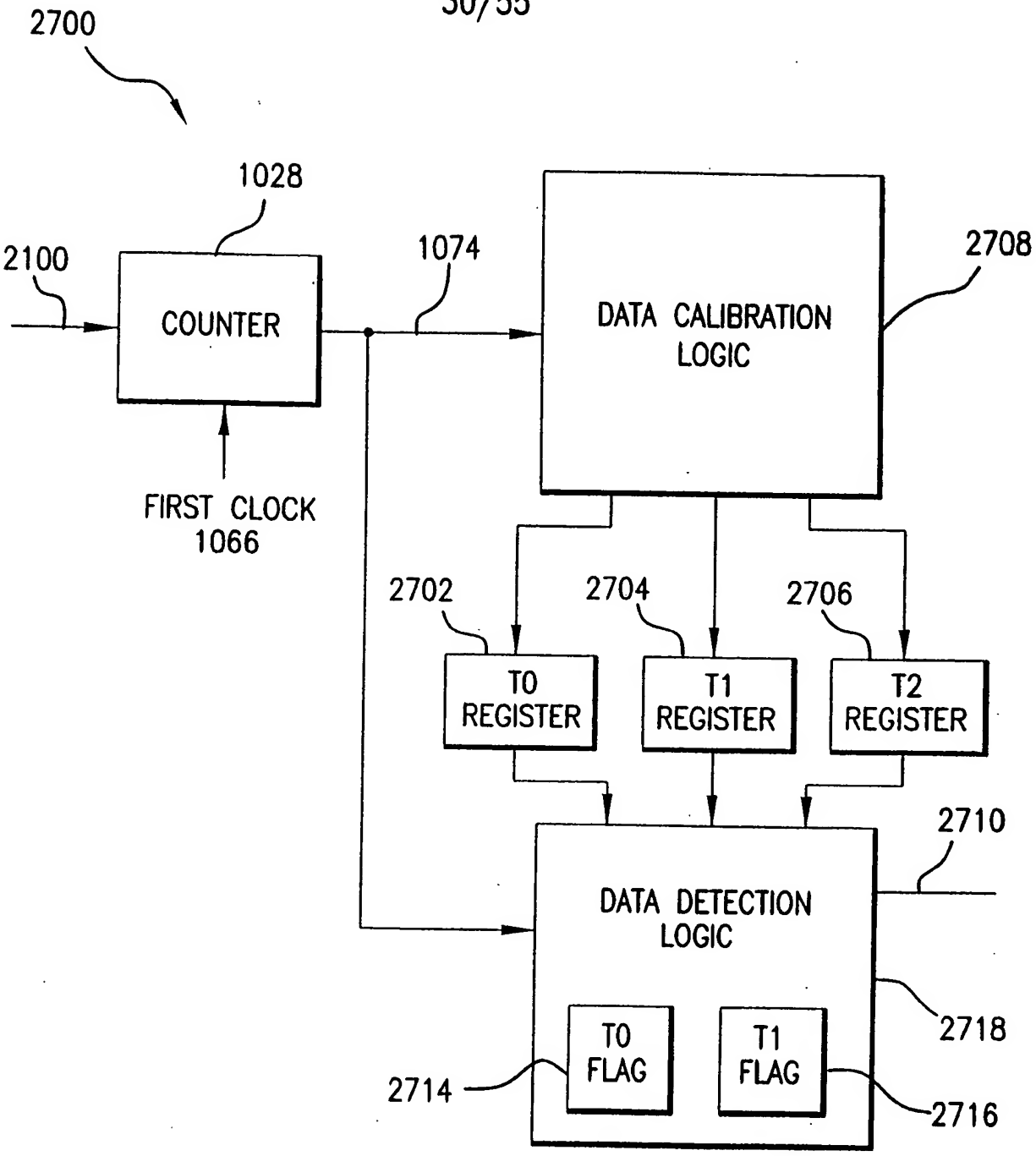
2700
1028
2100
COUNTER
1074
DATA CALIBRATION LOGIC
2708
FIRST CLOCK 1066
2702
2704
2706
T0 REGISTER
T1 REGISTER
T2 REGISTER
2710
DATA DETECTION LOGIC
2718
T0 FLAG
T1 FLAG
2714
2716

FIG.27

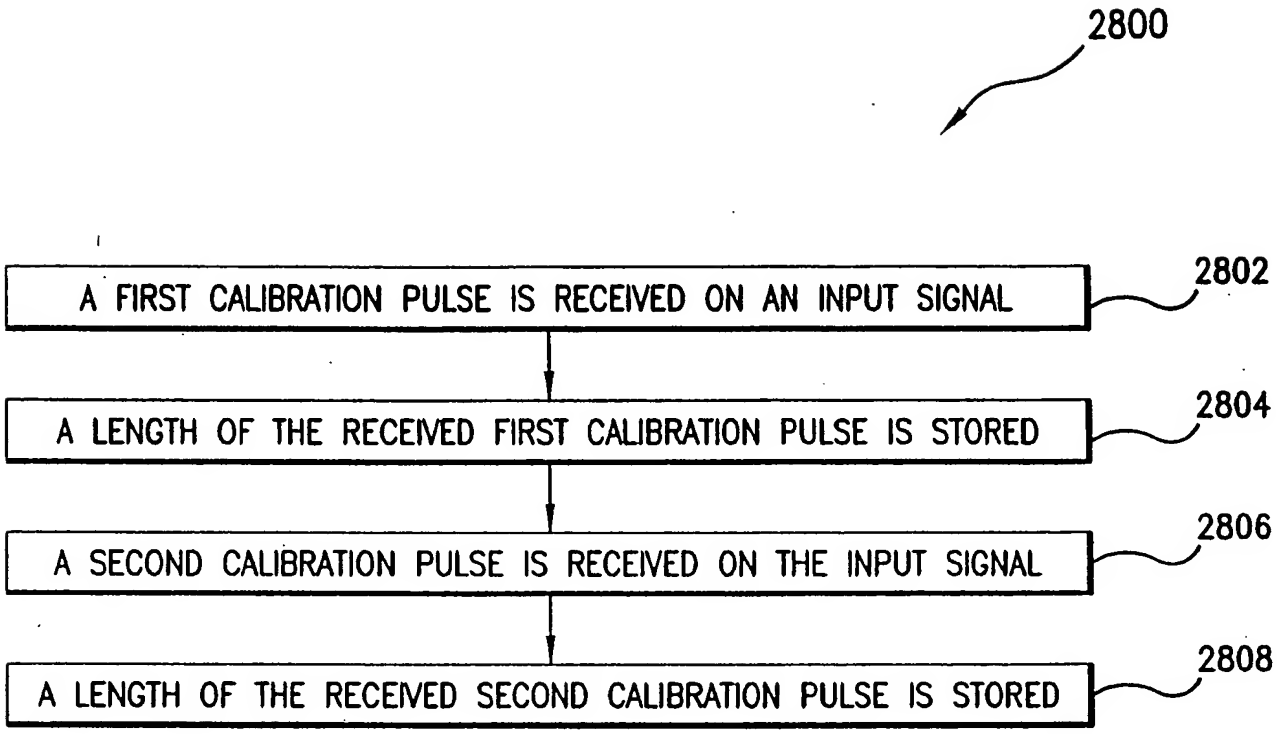
2800
A FIRST CALIBRATION PULSE IS RECEIVED ON AN INPUT SIGNAL
2802
A LENGTH OF THE RECEIVED FIRST CALIBRATION PULSE IS STORED
2804
A SECOND CALIBRATION PULSE IS RECEIVED ON THE INPUT SIGNAL
2806
A LENGTH OF THE RECEIVED SECOND CALIBRATION PULSE IS STORED
2808

FIG.28A

Replacement Sheet
Sheet 32 of 55
Appl. No. 10/072,885; Filed: Feb 12, 2002
Dkt No. 1689.0210001; Group Unit: 2636
Inventors: SHANKS et al.
Tel. No.: 202-371-2600
For: Method, System, and Apparatus for Binary Traversal of a Tag Population

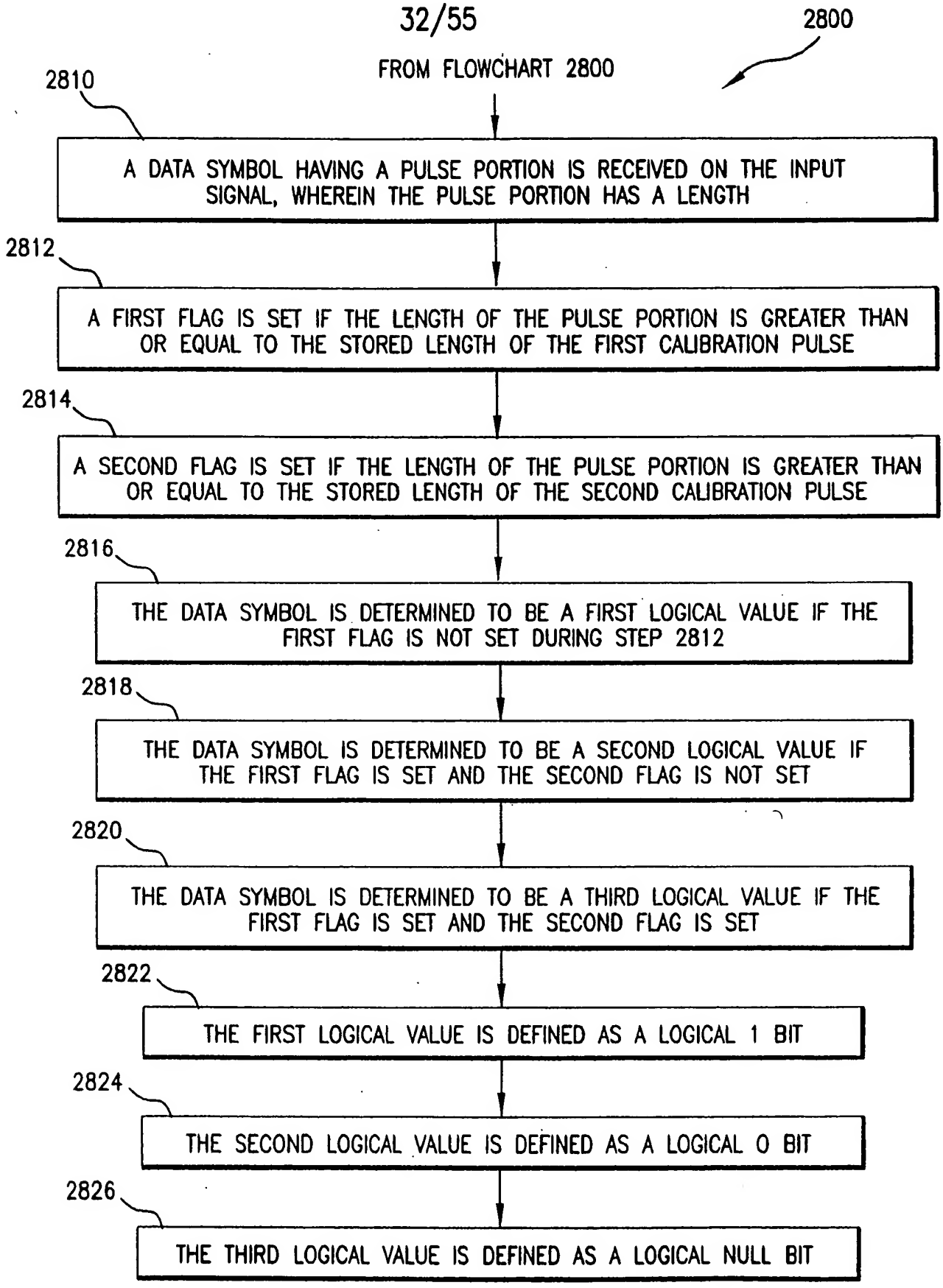

FIG.28B

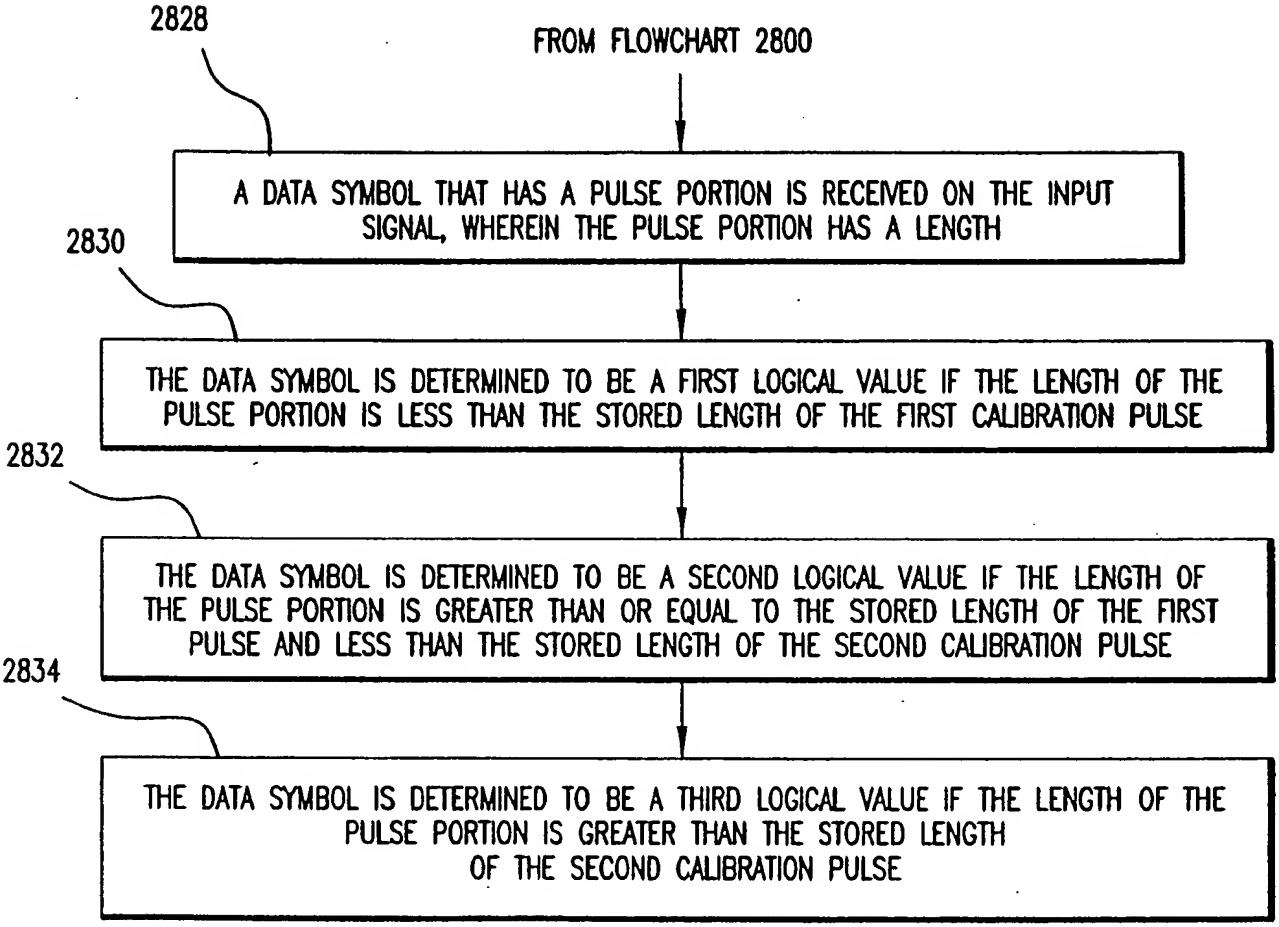
2828
FROM FLOWCHART 2800
A DATA SYMBOL THAT HAS A PULSE PORTION IS RECEIVED ON THE INPUT SIGNAL, WHEREIN THE PULSE PORTION HAS A LENGTH
2830
THE DATA SYMBOL IS DETERMINED TO BE A FIRST LOGICAL VALUE IF THE LENGTH OF THE PULSE PORTION IS LESS THAN THE STORED LENGTH OF THE FIRST CALIBRATION PULSE
2832
THE DATA SYMBOL IS DETERMINED TO BE A SECOND LOGICAL VALUE IF THE LENGTH OF THE PULSE PORTION IS GREATER THAN OR EQUAL TO THE STORED LENGTH OF THE FIRST PULSE AND LESS THAN THE STORED LENGTH OF THE SECOND CALIBRATION PULSE
2834
THE DATA SYMBOL IS DETERMINED TO BE A THIRD LOGICAL VALUE IF THE LENGTH OF THE PULSE PORTION IS GREATER THAN THE STORED LENGTH OF THE SECOND CALIBRATION PULSE

FIG.28C

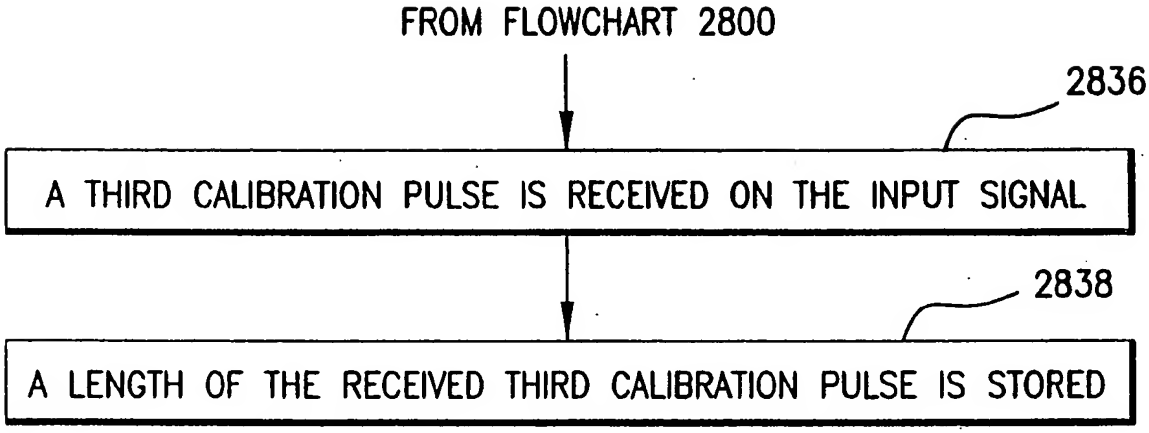
FROM FLOWCHART 2800
2836
A THIRD CALIBRATION PULSE IS RECEIVED ON THE INPUT SIGNAL
2838
A LENGTH OF THE RECEIVED THIRD CALIBRATION PULSE IS STORED

FIG.28D

Replacement Sheet
Sheet 35 of 55
Appl. No. 10/072,885; Filed: Feb 12, 2002
Dkt No. 1689.0210001; Group Unit: 2636
Inventors: SHANKS et al.
Tel. No.: 202-371-2600
For: Method, System, and Apparatus for Binary Traversal of a Tag Population

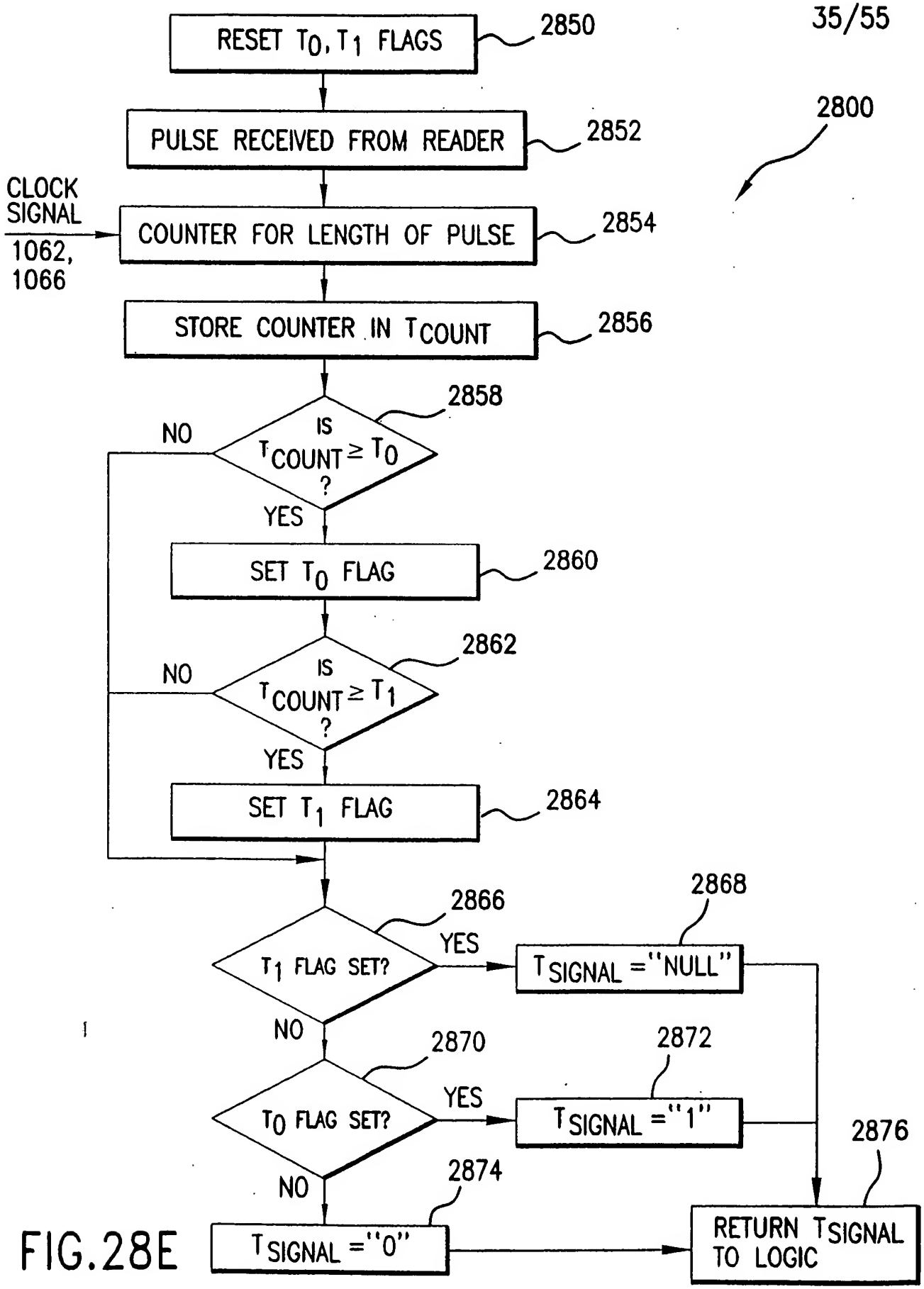

FIG.28E

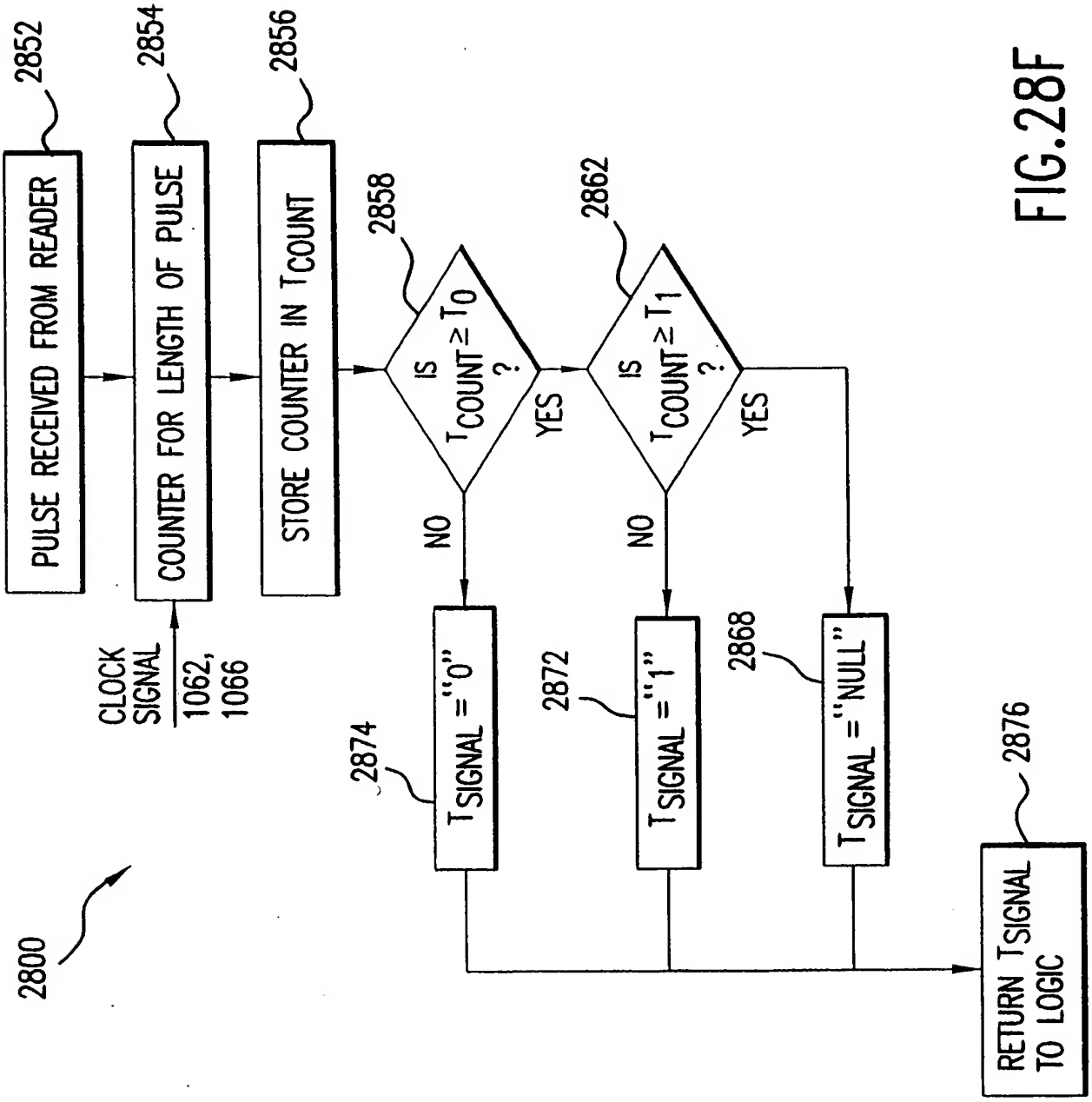
2800
2852
PULSE RECEIVED FROM READER
2854
COUNTER FOR LENGTH OF PULSE
2856
STORE COUNTER IN TCOUNT
2858
IS TCOUNT ≥ T0 ?
YES
NO
2862
IS TCOUNT ≥ T1 ?
YES
NO
CLOCK SIGNAL 1062, 1066
2874
TSIGNAL = "0"
2872
TSIGNAL = "1"
2868
TSIGNAL = "NULL"
2876
RETURN TSIGNAL TO LOGIC

FIG.28F

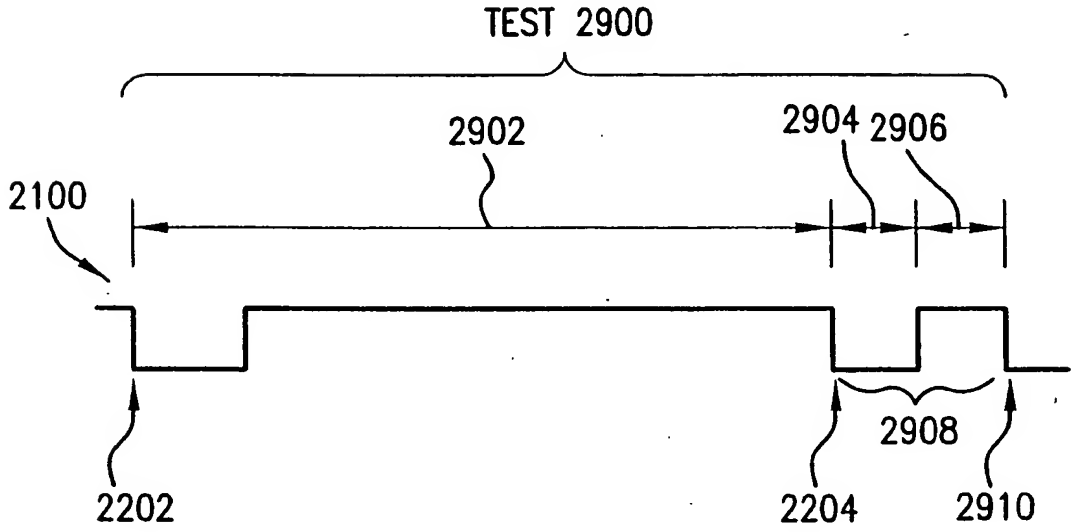

FIG.29

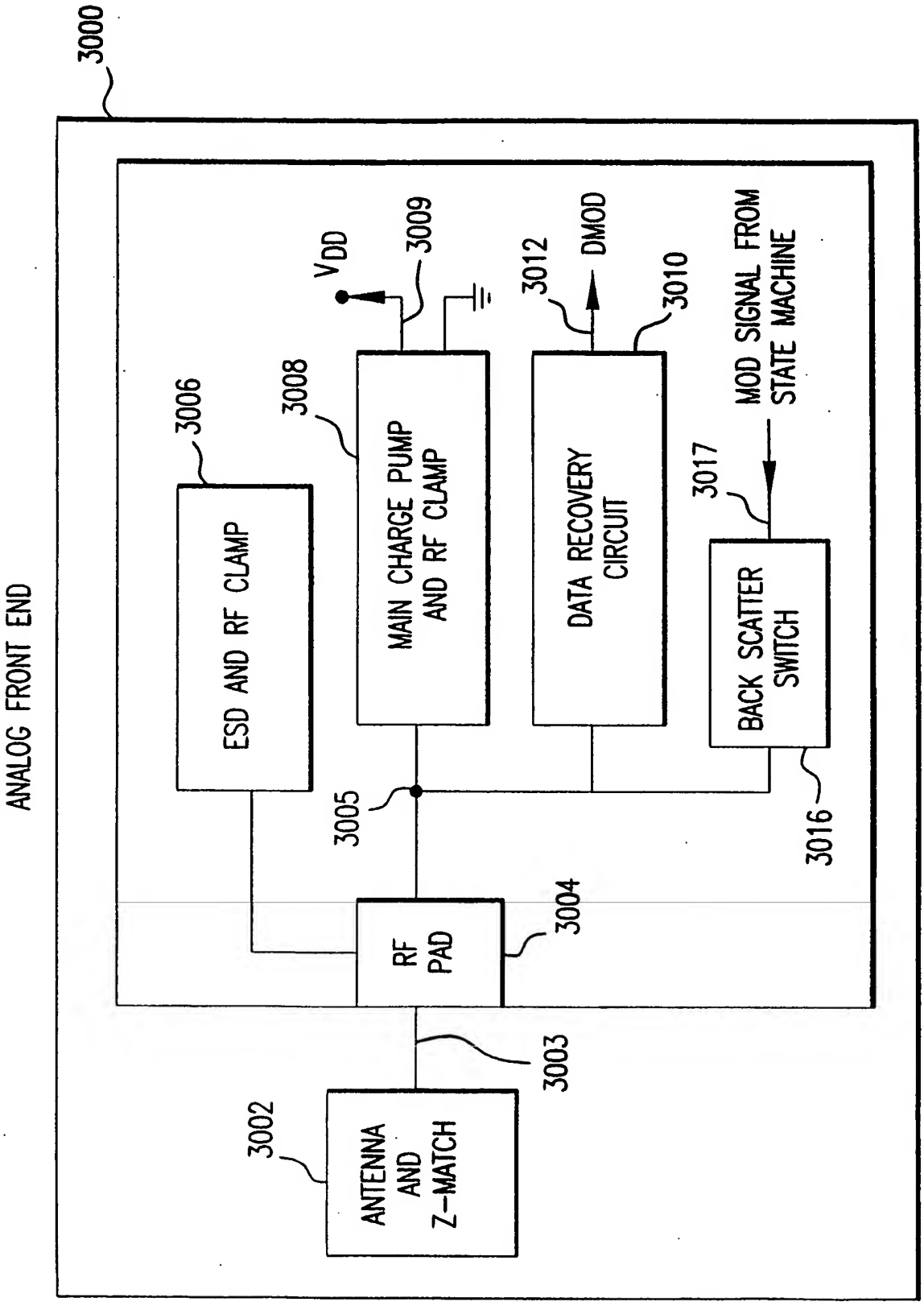
3000
ANALOG FRONT END
ESD AND RF CLAMP
3006
MAIN CHARGE PUMP AND RF CLAMP
3008
V_{DD}
3009
DATA RECOVERY CIRCUIT
3012
DMOD
3010
MOD SIGNAL FROM STATE MACHINE
3017
BACK SCATTER SWITCH
3016
3005
RF PAD
3004
3003
ANTENNA AND Z-MATCH
3002

FIG.30

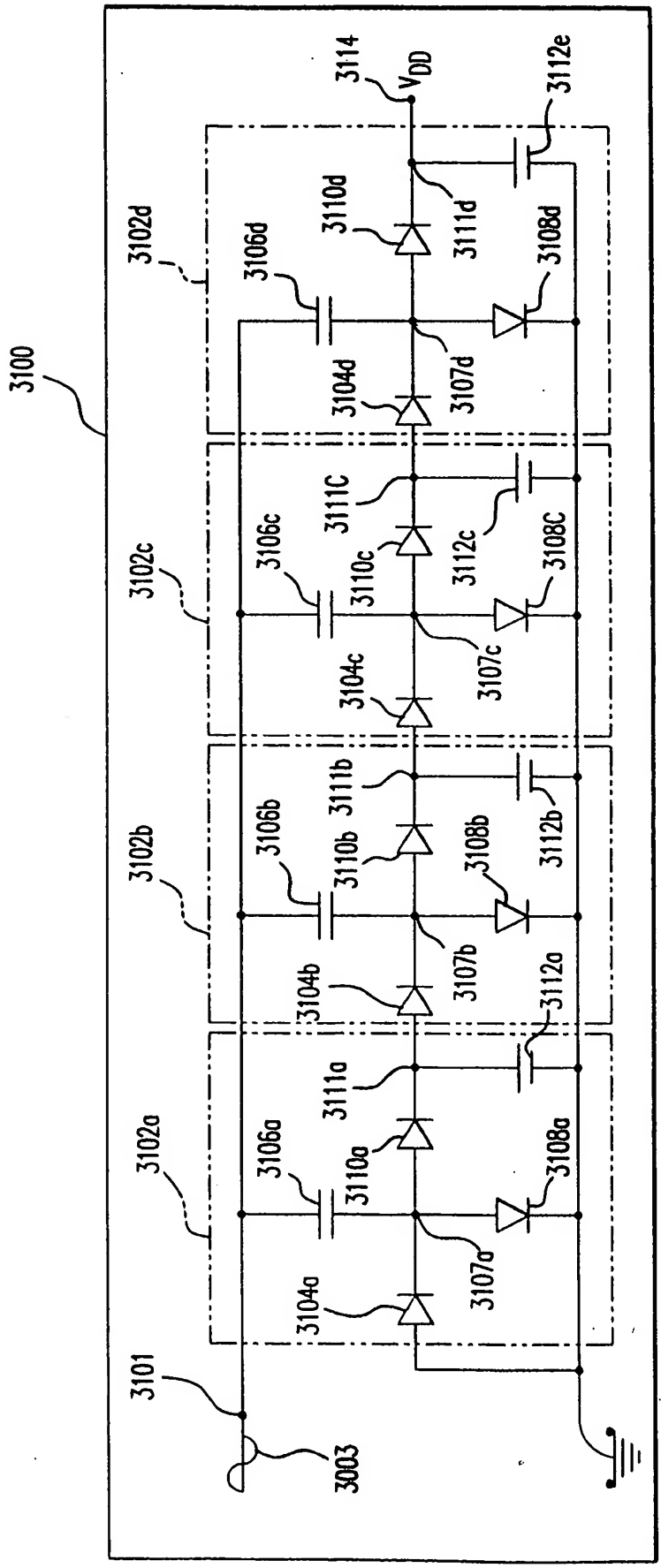
3100
3101
3003
3102a
3102b
3102c
3102d
3104a
3104b
3104c
3104d
3106a
3106b
3106c
3106d
3107a
3107b
3107c
3107d
3108a
3108b
3108C
3108d
3110a
3110b
3110c
3110d
3111a
3111b
3111C
3111d
3112a
3112b
3112c
3112e
3114
V_{DD}

FIG.31

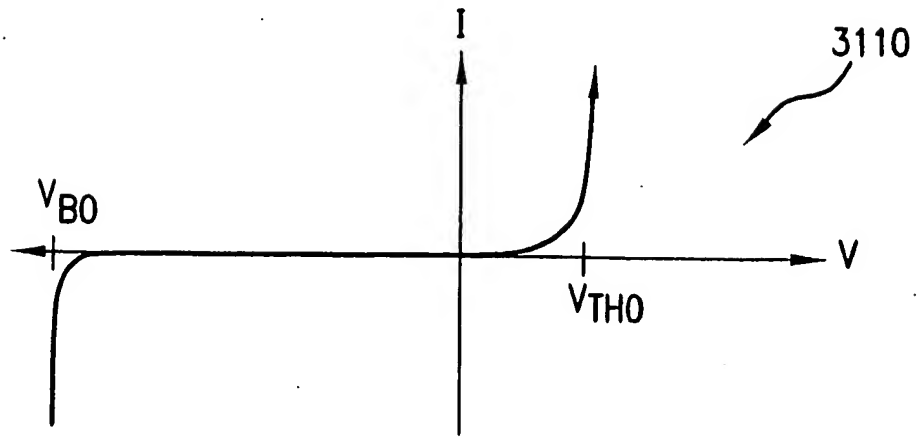

FIG.32A

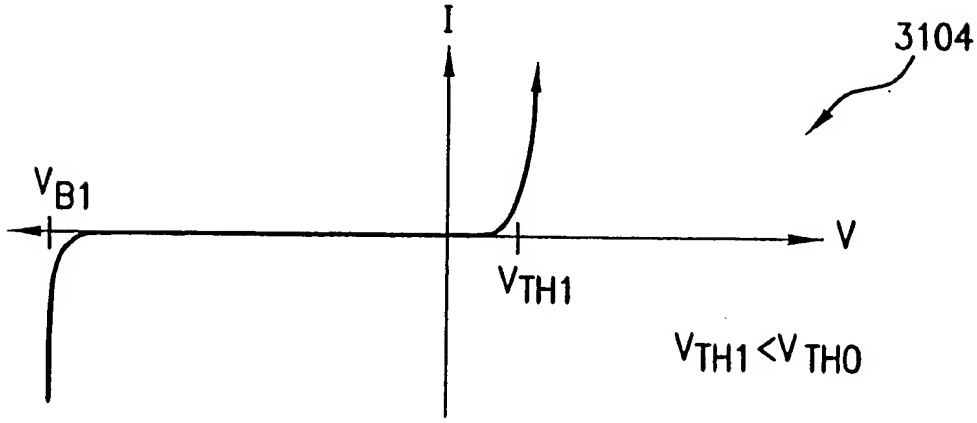

FIG.32B

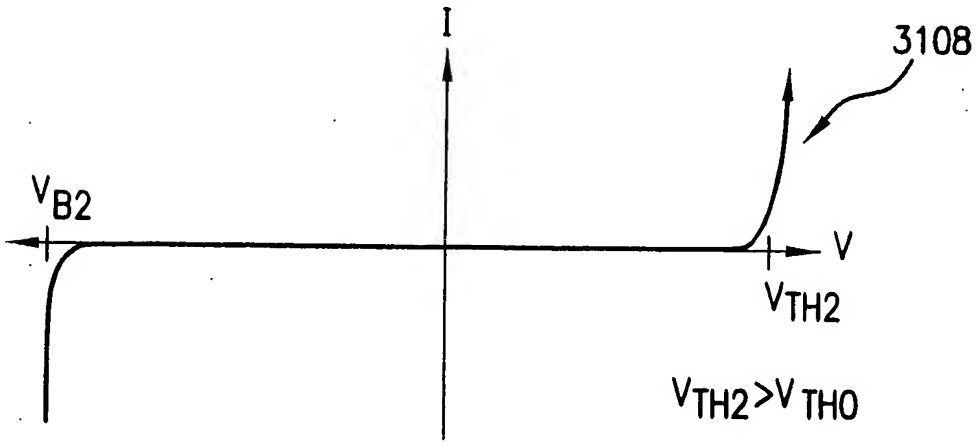

FIG.32C

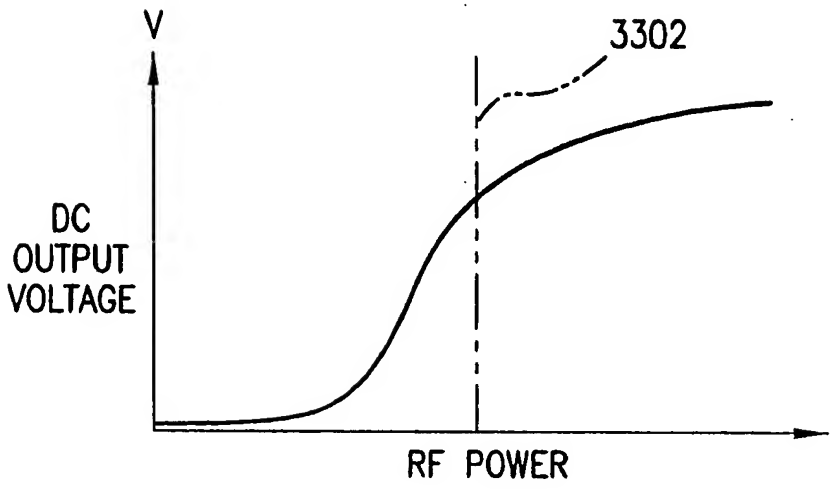

FIG.33A

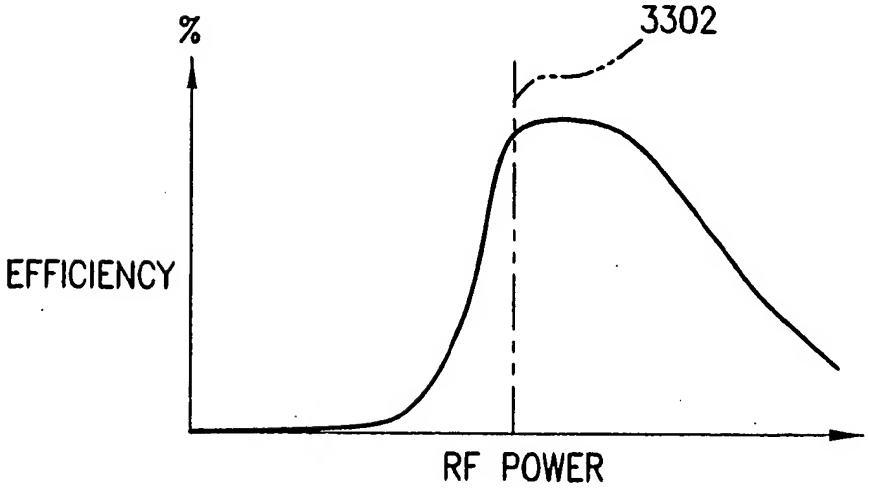

FIG.33B

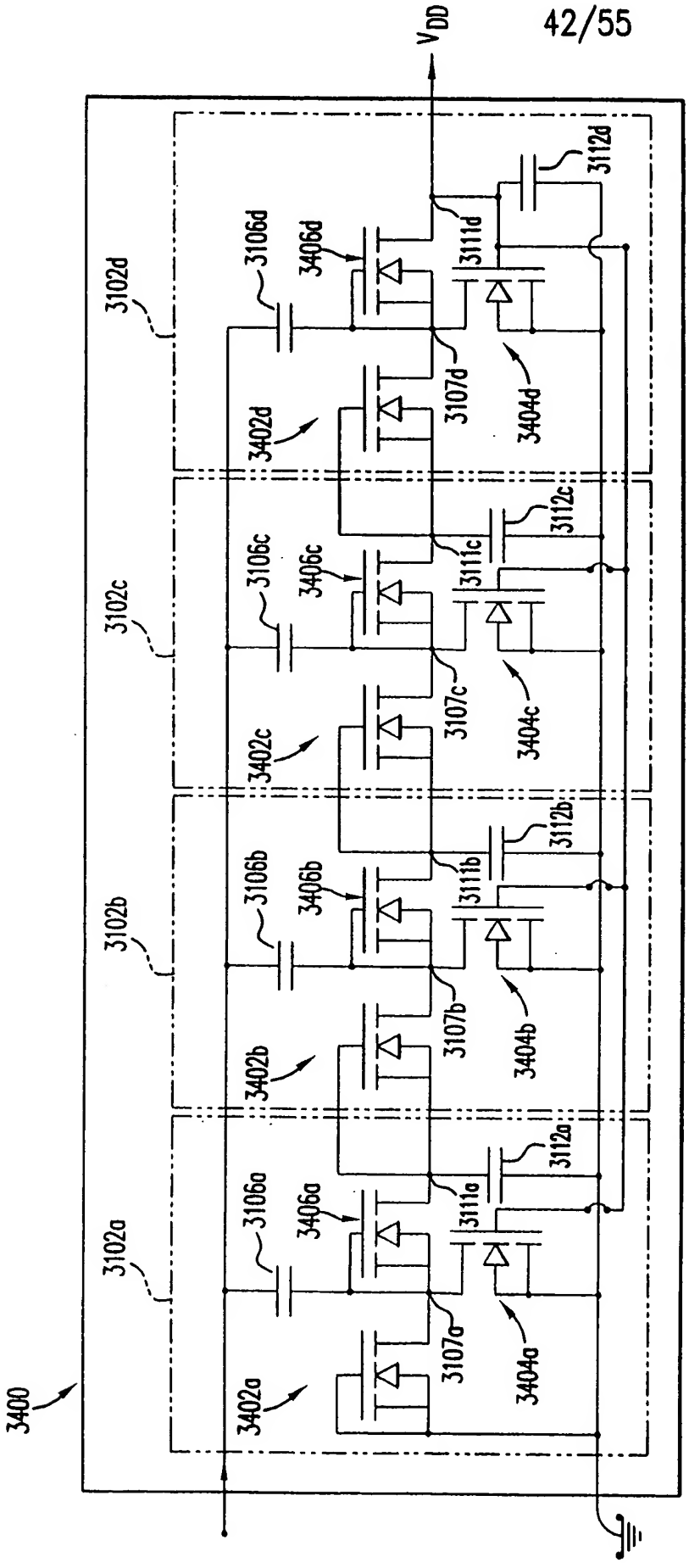
V_{DD}
3400
3102a
3102b
3102c
3102d
3106a
3106b
3106c
3106d
3111a
3111b
3111c
3111d
3112a
3112b
3112c
3112d
3107a
3107b
3107c
3107d
3402a
3402b
3402c
3402d
3406a
3406b
3406c
3406d
3404a
3404b
3404c
3404d

FIG.34A

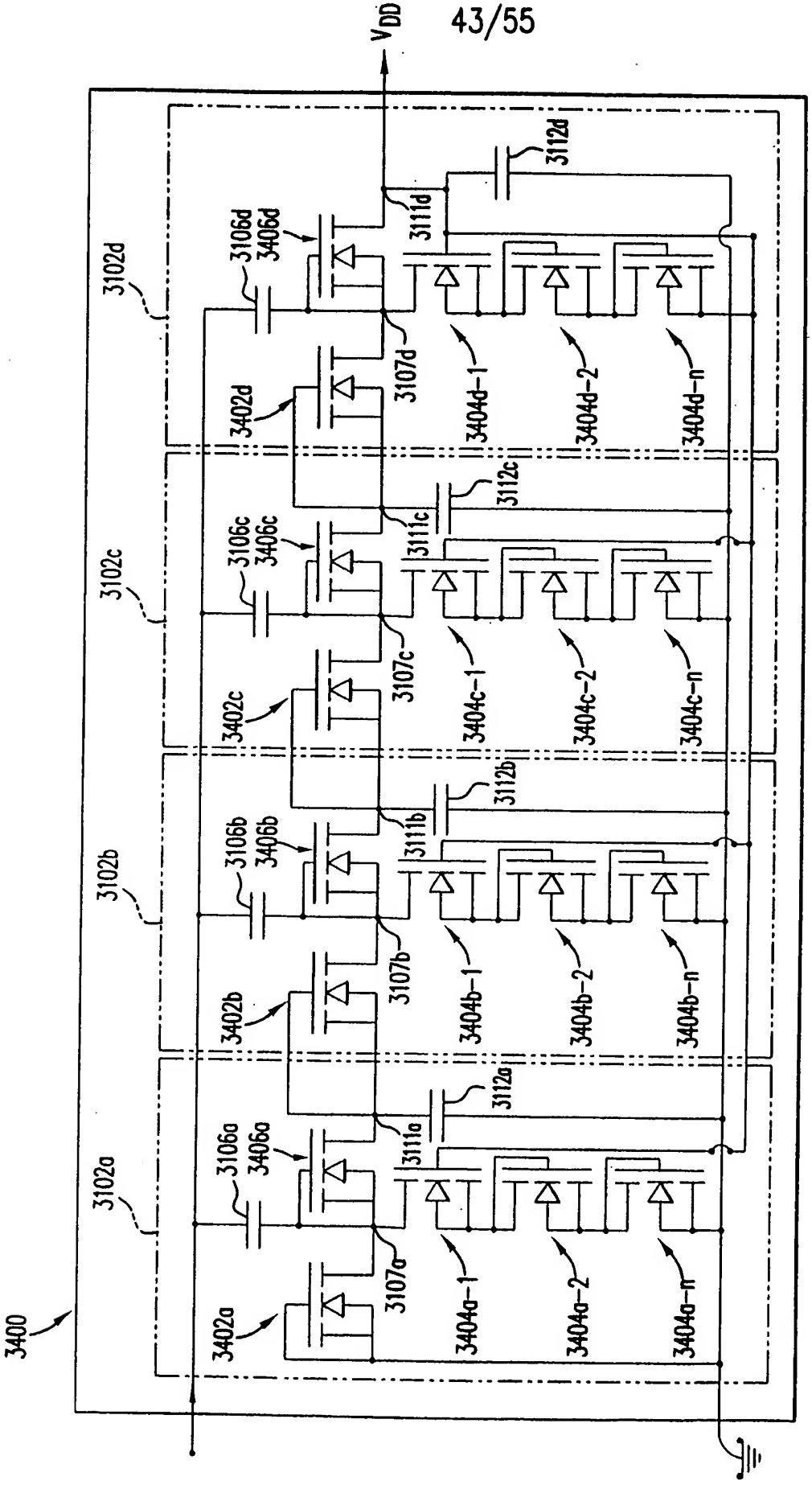
V_{DD}
3400
3102d
3102c
3102b
3102a
3106d
3406d
3106c
3406c
3106b
3406b
3106a
3406a
3111d
3111c
3111b
3111a
3112d
3112c
3112b
3112a
3107d
3107c
3107b
3107a
3402d
3402c
3402b
3402a
3404d-1
3404d-2
3404d-n
3404c-1
3404c-2
3404c-n
3404b-1
3404b-2
3404b-n
3404a-1
3404a-2
3404a-n

FIG.34B

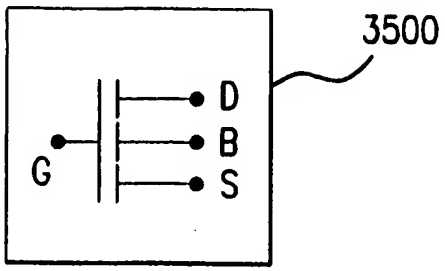

FIG.35A

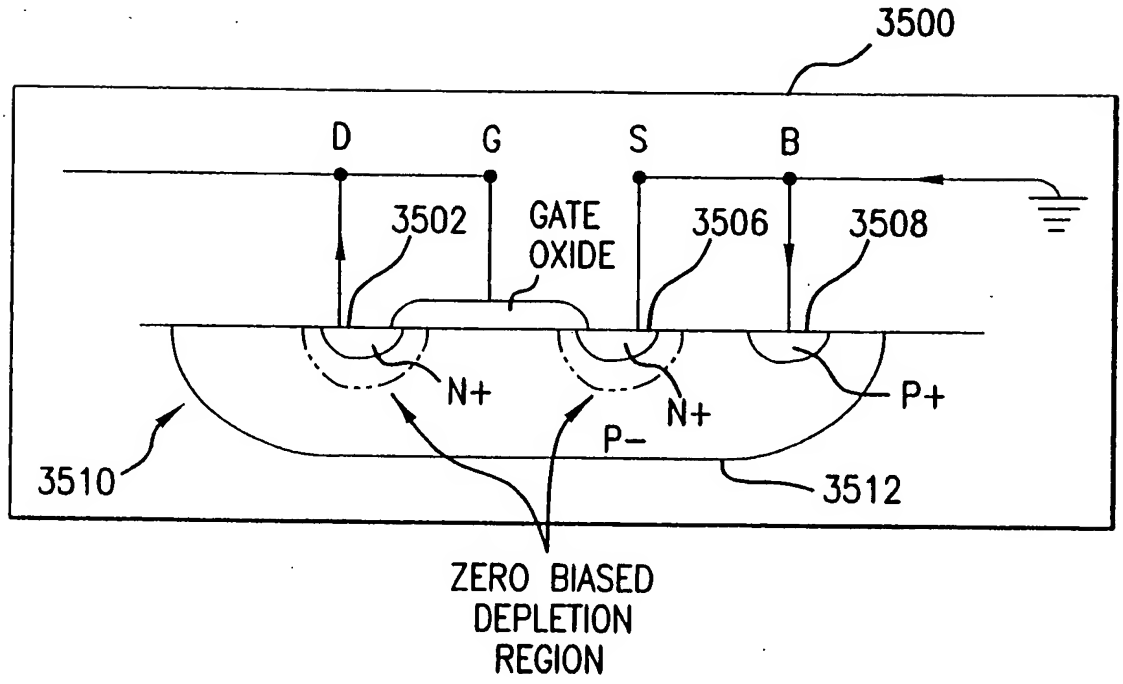

FIG.35B

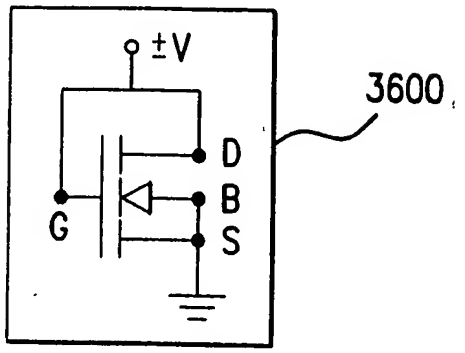

FIG.36A

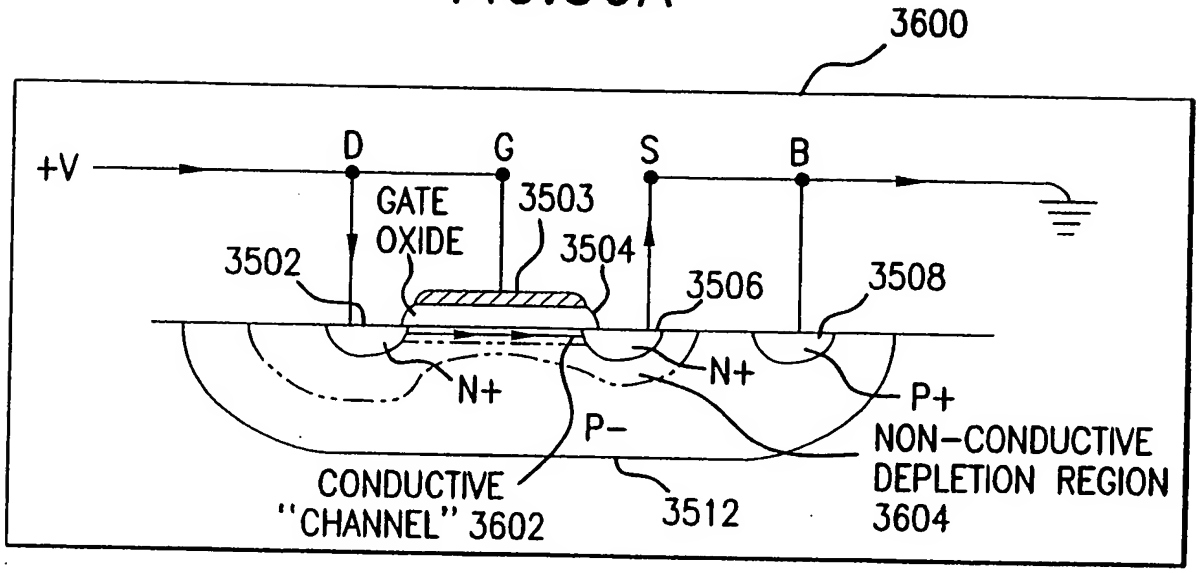

FIG.36B

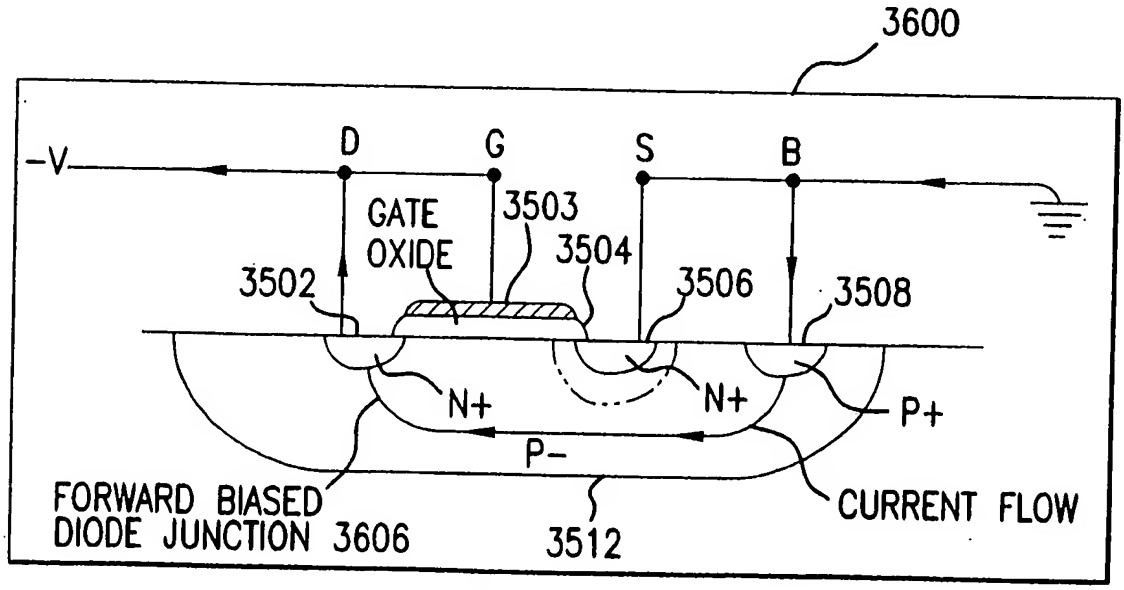

FIG.36C

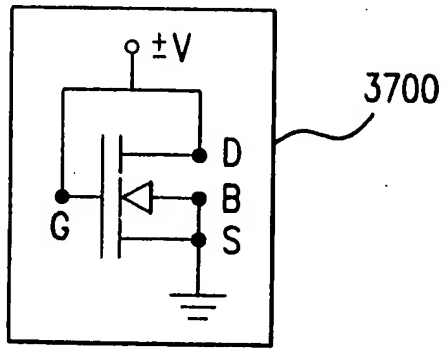

FIG.37A

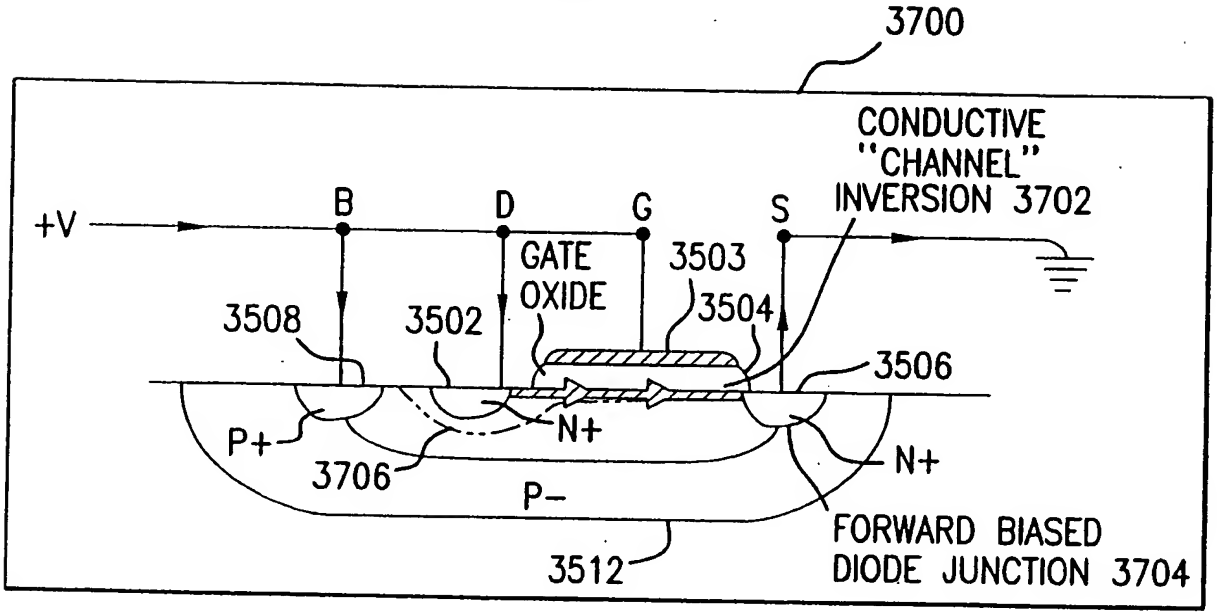

FIG.37B

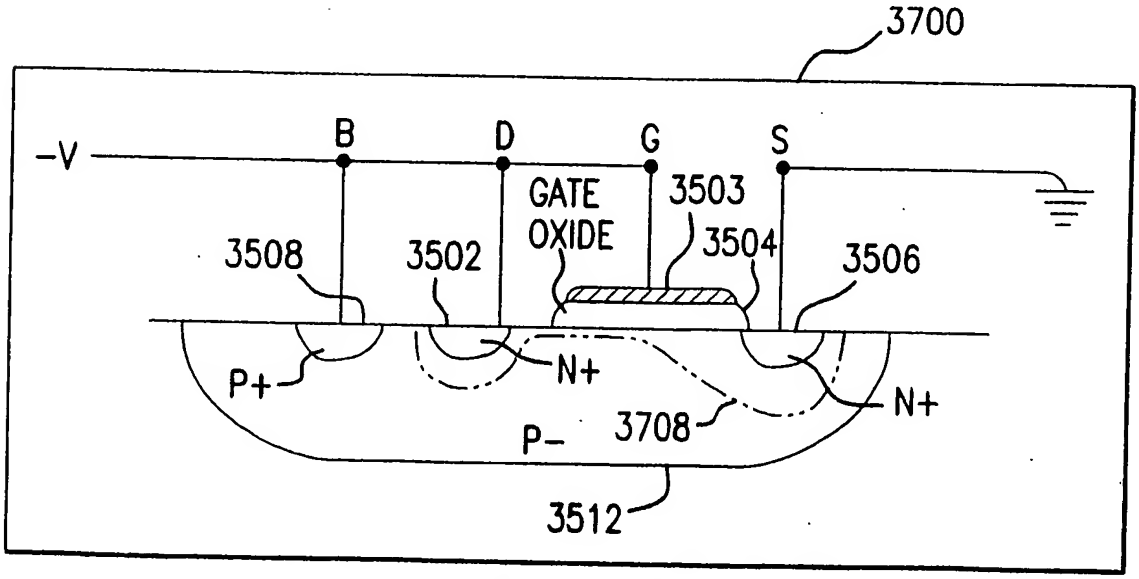

FIG.37C

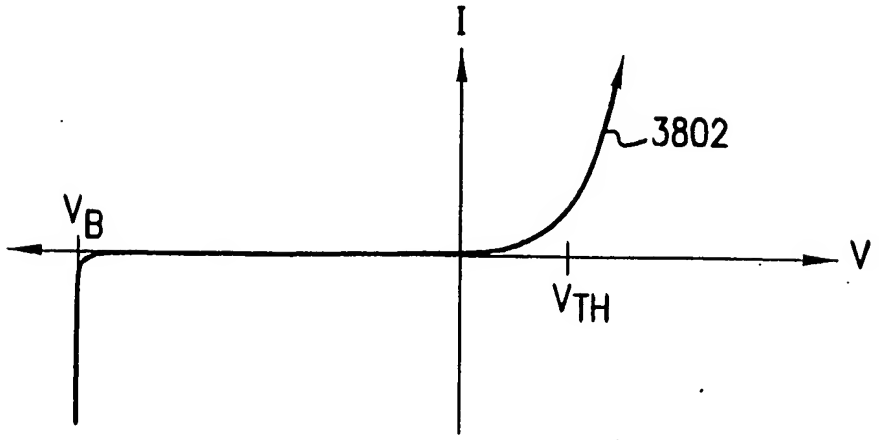

FIG.38A

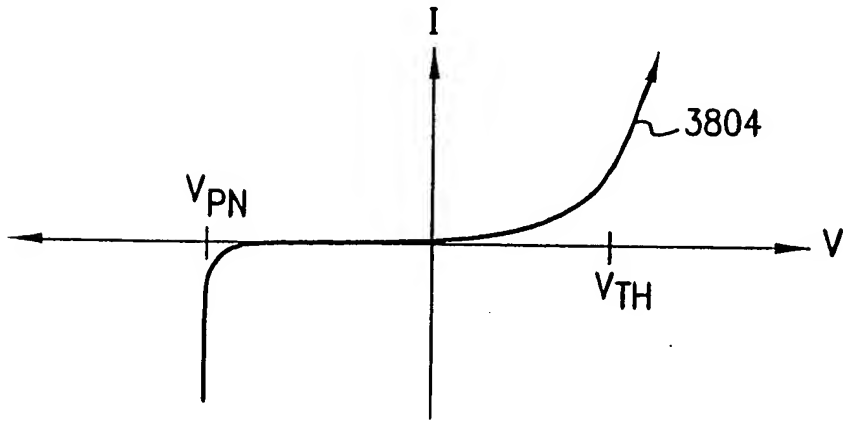

FIG.38B

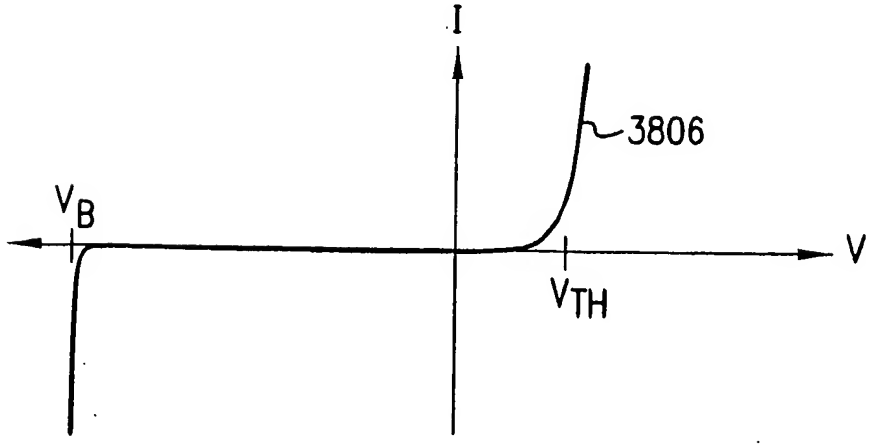

FIG.38C

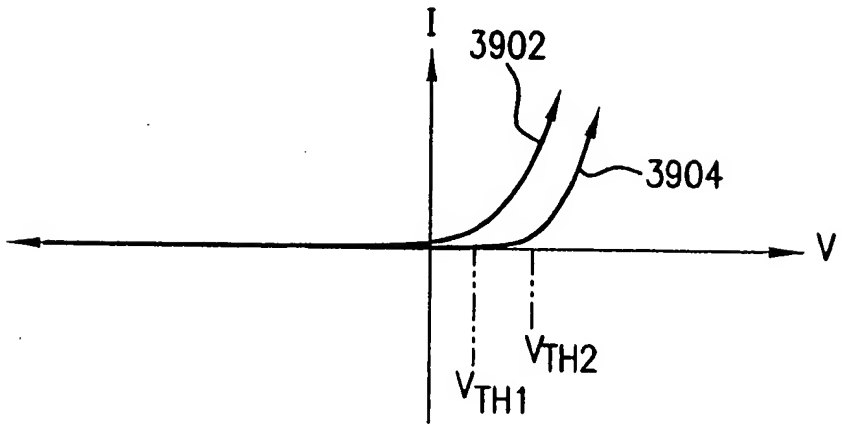

FIG.39

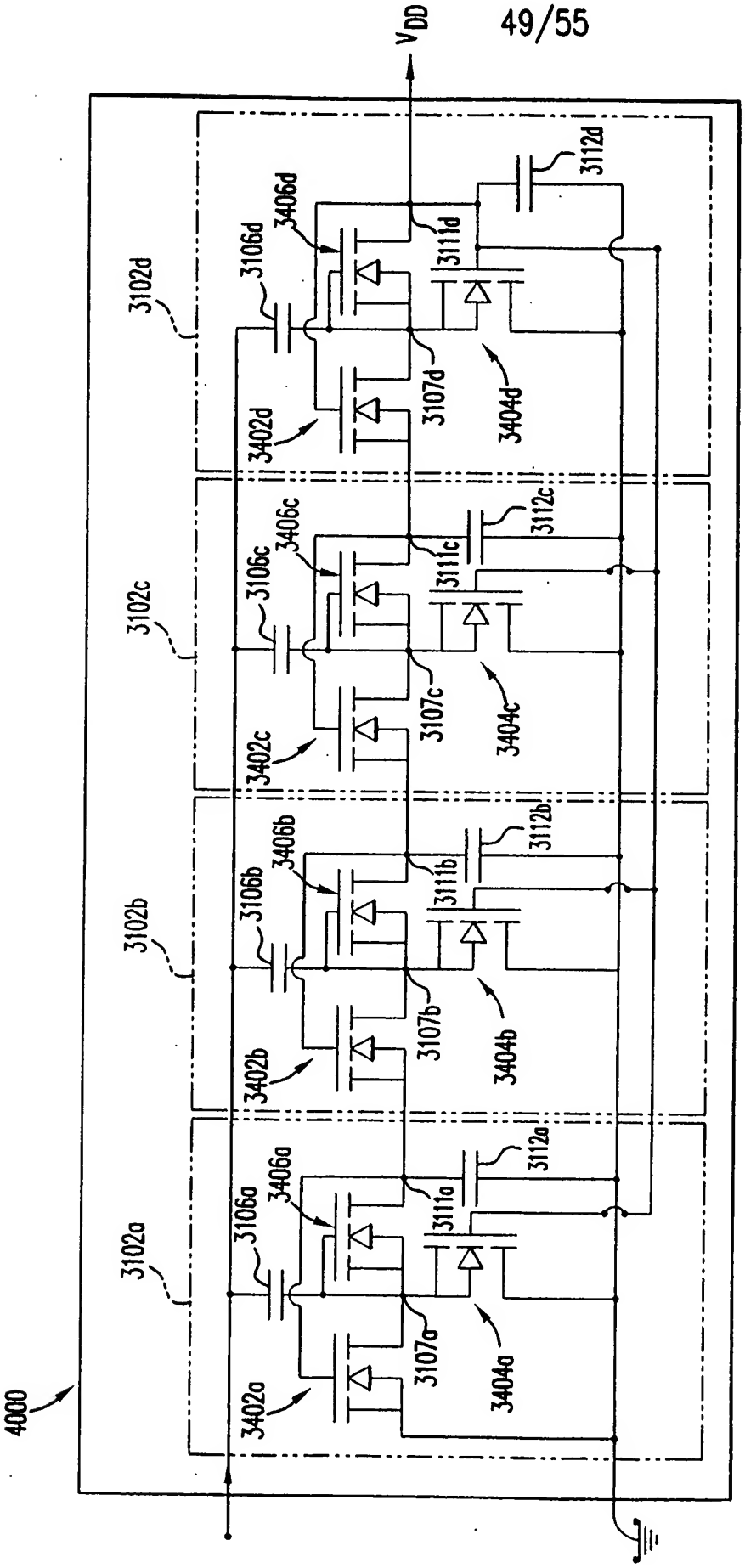
V_{DD}
4000
3102a
3102b
3102c
3102d
3106a
3106b
3106c
3106d
3107a
3107b
3107c
3107d
3111a
3111b
3111c
3111d
3112a
3112b
3112c
3112d
3402a
3402b
3402c
3402d
3404a
3404b
3404c
3404d
3406a
3406b
3406c
3406d

FIG. 40A

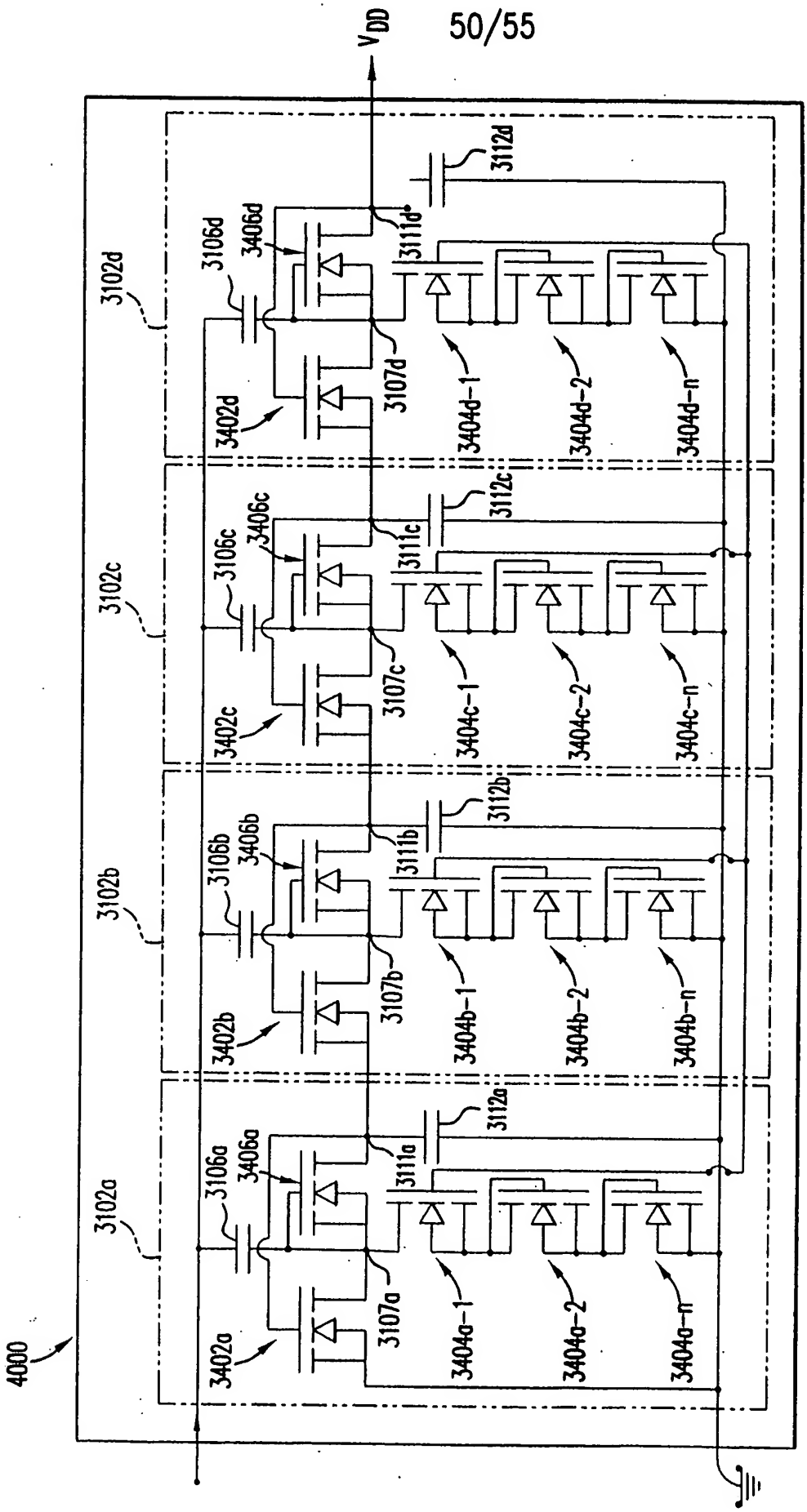
V_{DD}
4000
3102d
3102c
3102b
3102a
3106d
3106c
3106b
3106a
3406d
3406c
3406b
3406a
3111d
3111c
3111b
3111a
3112d
3112c
3112b
3112a
3107d
3107c
3107b
3107a
3402d
3402c
3402b
3402a
3404d-1
3404d-2
3404d-n
3404c-1
3404c-2
3404c-n
3404b-1
3404b-2
3404b-n
3404a-1
3404a-2
3404a-n

FIG.40B

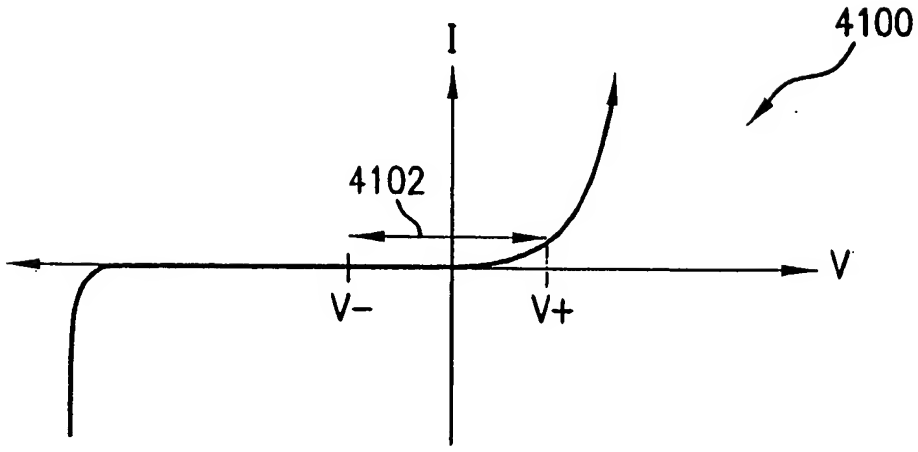

FIG.41A

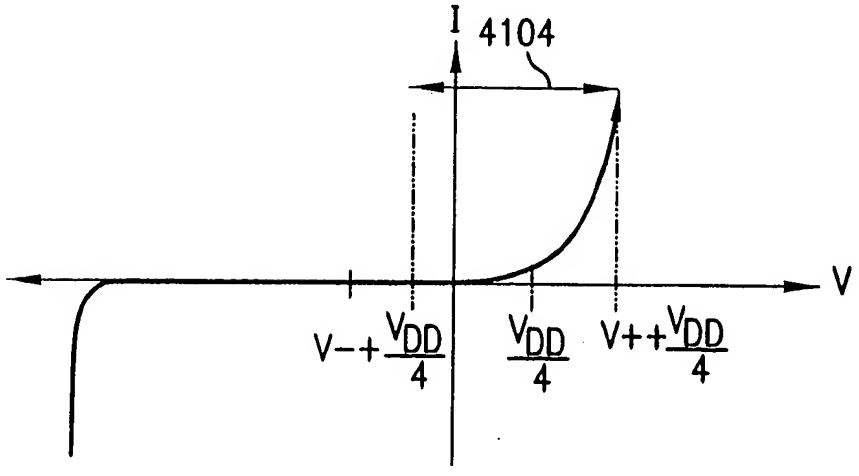

FIG.41B

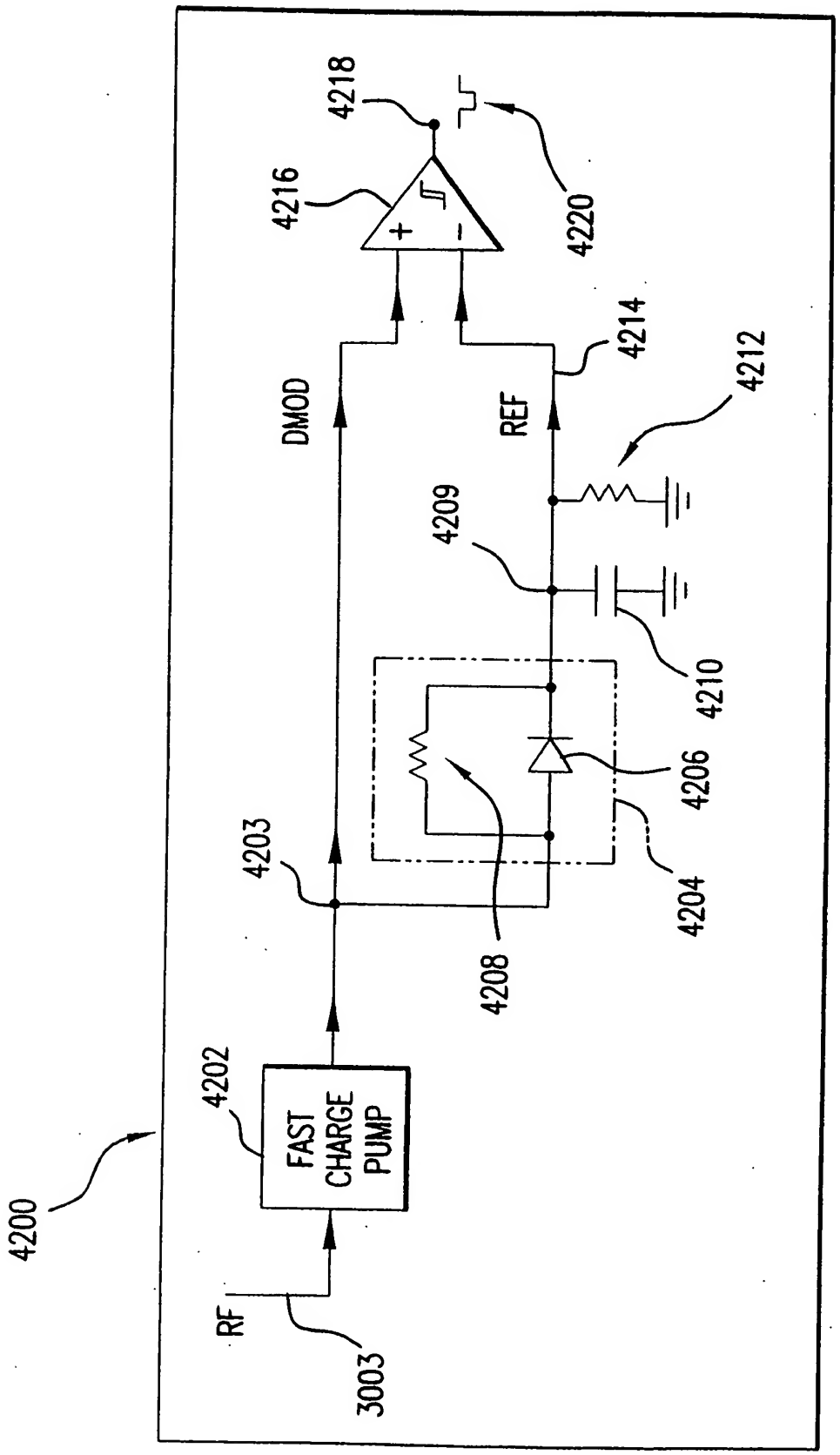
4218
4216
4220
4214
4212
DMOD
REF
4209
4210
4206
4204
4203
4208
4202
FAST CHARGE PUMP
4200
RF
3003

FIG. 42

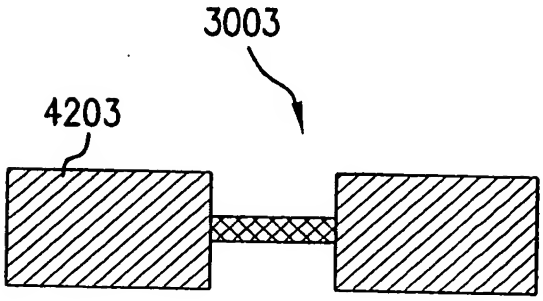

FIG.43A

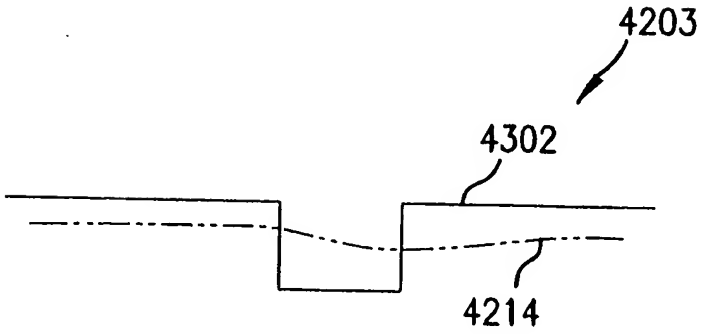

FIG.43B

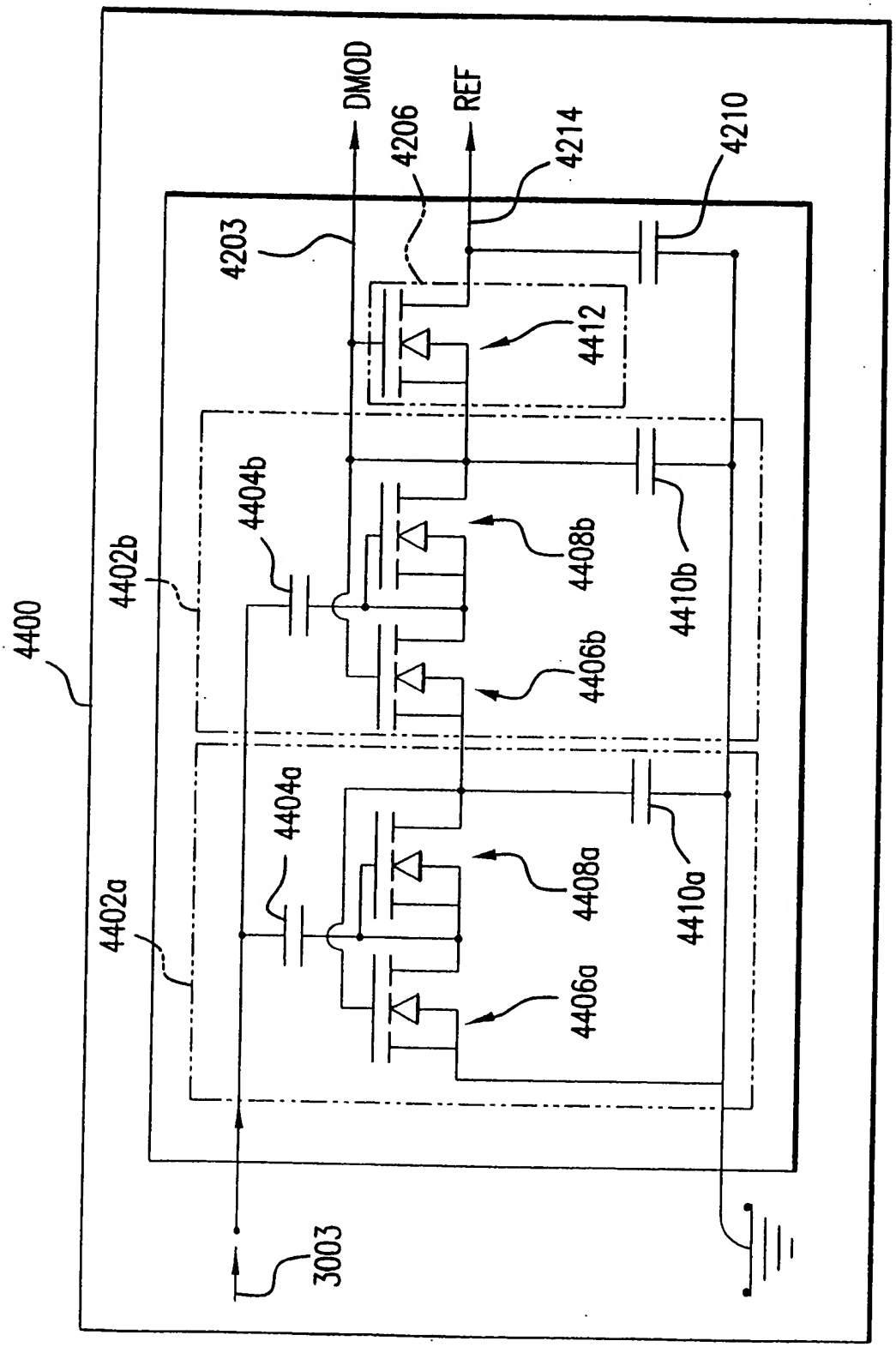
DMOD
REF
4206
4214
4210
4203
4412
4404b
4408b
4410b
4402b
4400
4406b
4404a
4408a
4410a
4402a
4406a
3003

FIG.44

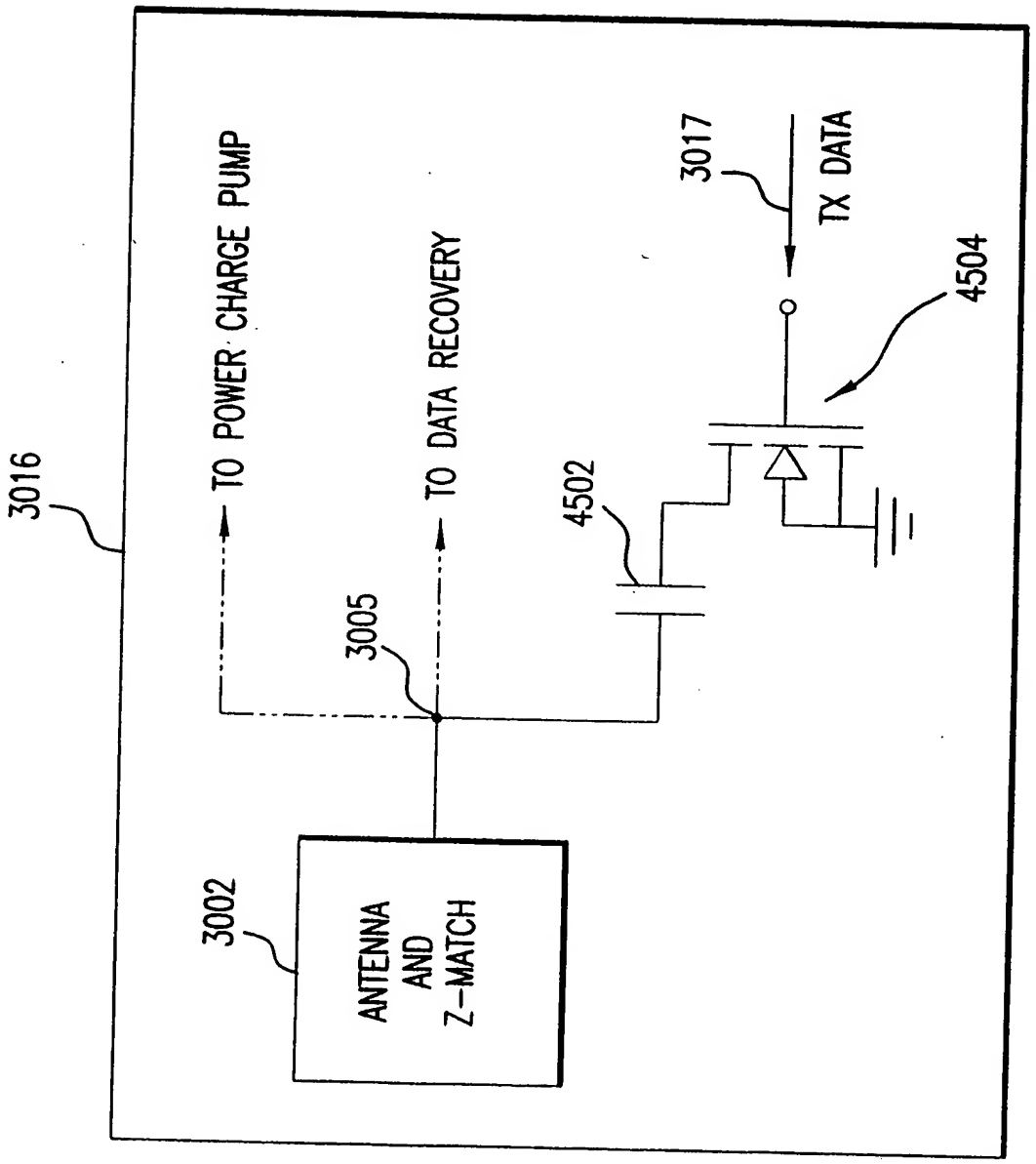
3016
TO POWER CHARGE PUMP
TO DATA RECOVERY
3017
TX DATA
4504
4502
3005
3002
ANTENNA AND Z-MATCH

FIG.45